

QK
80
.13C2
A54p

HERBERTIA

VOLUME 50

1994 • 1995



RECEIVED
JUL 10 1892

FIELD MUSEUM LIBRARY

HERBERTIA™

the journal of the International Bulb Society, is devoted to the botany and horticulture of geophytic/bulbous plants. Special emphases are the Amaryllidaceae and all petaloid monocot families rich in bulbous or cormous plants. Articles treating any aspects of dicotyledonous geophytes are welcomed as well.

VOLUME 50, 1994 • 1995

ISSN: 8756-9418

Copyright © 1995

International Bulb Society™

Volume 50 publication date: 15 June 1995

ISSUE EDITOR

Michael G. Vassar

EXECUTIVE DIRECTOR

Charles E. Hardman

BOARD OF DIRECTORS & PUBLICATIONS COMMITTEE

Dr. Charles Gorenstein

Dylan P. Hannon

Charles E. Hardman

Dr. Alan W. Meerow

Elisabeth I. Lassanyi

Michael G. Vassar

ADDRESS FOR ALL CORRESPONDENCE

All correspondence should be sent to the following address:

International Bulb Society
P.O. Box 92136, Pasadena CA 91109-2136
United States of America

The International Bulb Society is a non-profit, scientific and educational organization incorporated in California in 1943. Dues and donations to the Society are tax-deductible under Section 501 (c)3 of the Internal Revenue Service Code. Dues are U.S. \$30.00 per calendar year for U.S. addresses; subscriptions for addresses outside the U.S.A. are \$40.00 annually, payable by checks *drawn on a U.S. bank only*, international money order, or U.S. dollars (currency) to the International Bulb Society, mailed to the above address only. Journal and newsletters will be sent via air mail to addresses outside the United States.

Please note: Your subscription term will not be affected by the 1994-1995 cover date. We are simply correcting a previous date lag problem. Volume numbers remain consecutive.

RECEIVED
AUG 08 1995
FIELD MUSEUM LIBRARY

Material appearing in **HERBERTIA**TM may be photocopied for non-commercial scientific or educational purposes for the advancement of knowledge.

Opinions expressed in this issue are those of their respective authors and do not necessarily reflect the opinions of the editor, members of the Board of Directors or the International Bulb Society, Inc.

Printed in Covina, California, United States of America by **Kandid Litho**.

The names **HERBERTIA** and **INTERNATIONAL BULB SOCIETY** are registered trademarks of the International Bulb Society.

BEQUEST APPEAL

The Board of Directors of the International Bulb Society is making a special appeal to those of you who would like to promote the cause of ornamental, bulbous plants. The Board asks that your last will and testament include a bequest to the International Bulb Society. There is so much more your Society could do if only the funds were available:

- more extensive field collecting trips to help save the world's rapidly disappearing plant species;
- scholarships for deserving young botanists and horticulturists;
- more color in future editions of **HERBERTIA**;
- publication of a revised edition of **AMARYLLIDACEAE** and other monographs on tuberous and bulbous species.

These are just a few of the plans being made for the society's future. The Board is asking that you become a part of these plans. Please write a bequest into your will to:

INTERNATIONAL BULB SOCIETY
P.O. Box 92136, Pasadena CA 91109-2136
United States of America

Cover Photo

Scilla peruviana is one of the finest and most dependable bulbs for a mediterranean climate garden. It can be used very effectively as a container plant also.

See article — Mediterranean Monocots on page 82.

Photo: M. Vassar

AVAILABLE PUBLICATIONS

DESCRIPTIVE CATALOG OF HEMEROCALLIS CLONES, 1893-1948 by Norton, Stuntz & Ballard. 100 pages. \$5.00

LINEAGICS by Hamilton Traub, 163 pages, \$10.00.

AN INTRODUCTION TO HERBERT'S "AMARYLLIDACEAE, ETC." 1837 AND RELATED WORKS, by Hamilton Traub. 93 pages, \$10.00

A REVIEW OF THE SOUTHERN AFRICAN SPECIES OF CYRTANTHUS, by C. Reid & R. Allen Dyer. 68 pages, 16 color photos. \$11.00

For orders of the above items sent to addresses outside of the United States of America, please add \$4.00 per copy for postage.

JOURNAL BACK ISSUES

SINGLE VOLUMES OF **HERBERTIA/PLANT LIFE**: Many back issues are now out of print. For an up to date list of available issues, please request a back issue order sheet, using the Society's mailing address on page 1. Available back issues are \$10.00 per volume plus \$4.00 extra postage for orders sent to an address outside the United States of America.

A SUBSCRIBER SERVICE: SEED AND BULB EXCHANGE

Member-subscribers may participate on a first-come, first-served basis in the IBS seed exchange. A moderate charge per seed packet is used to defray mailing expenses. The next seed and bulb listing will be mailed to all subscribers with the autumn 1995 newsletter which is planned to be mailed in late September. For more information or to donate seeds or bulbs, please contact:

Charles Gorenstein, IBS Seed/Bulb Exchange Director
5 Sand Oaks Road, Laguna Niguel CA 92677
United States of America

A NOTE TO CONTRIBUTING AUTHORS

Please request a copy of the contributors guidelines for authors. Articles must be received by IBS by 30 September for consideration for inclusion in the following years **HERBERTIA**. An author of a major article will receive 5 copies of **HERBERTIA** containing the article; additional copies can be supplied at cost if ordered when proof copy is returned. Please submit *copies* of artwork, slides, transparencies and maps. While care is taken with manuscripts and illustrations, we cannot be responsible for their return in original condition. Crisp, clear black and white photos, color slides, line drawings or other artwork are acceptable. Donations towards the cost of color separations are encouraged.

HERBERTIA™
VOLUME 50, 1994 • 1995

TABLE OF CONTENTS

A Message from the Executive Director Charles Hardman	6
The Origins of <i>Clivia miniata</i> 'Vico Yellow' and 'Vico Gold' Sir Peter Smithers	9
A Most Underappreciated Genus — <i>Oxalis</i> : Some Western Cape Species Michael G. Vassar	13
<i>Polyxena</i> as Pot Plants Richard L. Doult	18
The Correct Name of the Yemeni <i>Crinum</i> (Amaryllidaceae) F. Nigel Hepper	20
<i>Rhodophiala laeta</i> Phillippi, a Beautiful Amaryllid From Northern Chile Luis Arriagada and Otto Zöllner	22
Production of Triploid and Trisomic Plants in Japanese Iris, <i>Iris ensata</i> Thunb. Tsutomu Yabuya, Takao Sushida and Tafji Adachi ...	25
Cultural Requirements of <i>Ornithogalum saundersiae</i> A. Coos Bartels	36
A Field of Bulbs Dylan P. Hannon	39
The Correct Identity of <i>Hymenocallis galvestonensis</i> Amaryllidaceae T.M. Howard	48
<i>Tecophilaea cyanocrocus</i> Charles Hardman	60
Growing Hybrid Lilies Eugenia Dunbar	65

<i>Albuca</i>	
William T. Drysdale	66
Notes on <i>Crocus</i> (Iridaceae) in Syria and Jordan	
Helmut Kerndorff	68
Some Mediterranean Monocots	
Michael Salmon	82
Alliums — Flowering Onions	
Jan R. Bijl	89
Bulb Cultivation in Hong Kong	
Dennis Tsang	95
Errata	100
<i>Cybistetes longifolia</i> and the Amaryllidaceae of Ferrarii in 1633 a.d. Rome	
L.S. Hannibal	101
<i>Bletilla striata</i>	
Charles Hardman	107
A Source List of Geophytic Plant Material	
Dave Casebier	110
Swap Column	117
Book Reviews	118

INTRODUCTION:

This issue of HERBERTIA contains articles about geophytic plants from many areas of the world, including *Rhodophiala* and *Tecophilaea* from Chile, *Clivia*, *Polyxena* and *Oxalis* from South Africa, rare and interesting bulbs from north Africa, *Crocus* from Jordan, a *Crinum* from Yemen, iris hybridizing in Japan, a Texas native *Hymenocallis*, almost unknown bulbs from Southern California with uncertain futures, growing bulbs in the extremely variable climate of Hong Kong, a most interesting story of *Allium* hybridizing in Holland and more.

We include a source list, with plans to update and continue the list yearly with your help, advice and recommendations. Good sources should be promoted and acknowledged.

THE INTERNATIONAL BULB SOCIETY OUR FIRST SIXTY-TWO YEARS

Charles Hardman, Executive Director

With HERBERTIA Volume 50 which you are now holding in your hands, the International Bulb Society marks its *sixty-first* year of publication.

Born as the American Amaryllis Society on May 21, 1933, the society published its first yearbook in 1934, the low point of the great, worldwide depression. It was called, appropriately enough, YEAR BOOK, AMERICAN AMARYLLIS SOCIETY, Volume 1.

Why would a group of people start a flowering plant society and publish its first journal during two of the toughest years in the 20th century? In 1933 and 1934 one would think that people worldwide would be more concerned with eating than with growing flowers.

Dr. Hamilton P. Traub, one of the founders of the society and the yearbook's first editor tells us why on page 2 of the 1934 yearbook in the first two sentences of an article he called "Editorial Comment". "Some correspondents have wondered why the period of economic readjustment [the Great Depression] was chosen for the launching of the American Amaryllis Society. As a matter of fact, the event was probably in a great measure a coincidence since the interest in plants is only indirectly affected by economic upheavals".

In other words, why *not* start a plant society? People love plants, will grow plants and will seek information about them whether or not times are tough.

Dr. Traub continues, "The number of persons interested in *Amarylleae* is undoubtedly great enough to support a thriving organization — not the largest but surely a high quality association."

According to Dr. Traub, "The response [to the new society] was spontaneous and was not only confined to America but was worldwide. The roster of Charter Members speaks for itself."

From these words, we learn that the society had an international flavor from the very beginning, as people from countries throughout the world signed up to become a part of the newly organized American Amaryllis Society.

Dr. Traub neatly sums up the editorial policy of the society's yearbook by writing, "The editorial policy of the Year Book is to publish timely articles but without too much formality. The Year Book will be at all times of, for and by the members of the Society. However, when necessary to establish fundamental facts, entirely technical papers will be published."

That was, has been and is still our editorial policy.

Among the eighty charter members of the American Amaryllis

Society were members from many states and the District of Columbia, as well as Mr. Basil N. Ikeda of Japan; Mrs. Frank Joyce of Kenya, East Africa; Mr. E. H. Krelage of Holland; Mr. Kanjiro Okamoto of Japan; The Honorable Henry McLaren of Great Britain; Messrs. F. Rynveld & Zonen of Holland; the Messrs. C. G. Van Tubergen, Ltd. of Holland; and Mr. A. Worsley of England. Distinguished American names included Mr. Gordon Ainsley, Mr. Henry Buxton, Mr. Ricard Diener, Mr. E. G. Duckworth, Messrs. H. F. and Pierre S. Du Pont, Mr. J. N. Giridlian, Mr. Wyndham Hayward, Mr. Cecil E. Houdyshel, Mr. E. A. and Mrs. Rufus McIlhenny, Mr. Theodore L. Mead, Dr. Hamilton P. Traub himself, Mr. Thomas W. Whitaker, as well as the Brooklyn Botanic Garden.

Other distinguished names are listed as charter members of the society on pages 4 and 5 of that 1934 yearbook, but those mentioned will give you an idea of the enthusiasm generated among the gardening elite of that generation of sixty-two years ago.

Since January 28, 1934, the date Dr. Traub wrote the editorial comment quoted from above, the Society has gone from being called the American Amaryllis Society to the American Plant Life Society, to its present name: the International Bulb Society. We still love the amaryllids, but all bulbs, tubers, corms and rhizomes are now welcomed in our pages.

The name of our yearbook has changed, too. What used to be the American Amaryllis Society Yearbook was changed after only two years of publication to HERBERTIA. Then PLANT LIFE, another publication, came along in 1945 and was published during four years as a separate journal distinct from HERBERTIA. PLANT LIFE became the society's only publication in 1949. In 1984 the name was changed back to HERBERTIA.

People around the world seem to like the name HERBERTIA — it's not difficult to say, and, in fact, rolls off the tongue rather easily — although many question its origin. The name is derived from that of Mr. William Herbert (1778-1847), among whose many pursuits was the hobby of growing, observing, hybridizing, grouping, and writing about bulbous plants, especially the Amaryllidaceae. Mr. Herbert compiled his thoughts on this aspect of his plant hobby in AMARYLLIDACEAE which was first published in 1837. Although he wrote extensively throughout his life, his book AMARYLLIDACEAE remains William Herbert's major opus.

So where does the International Bulb Society stand at the seasoned age of sixty-two, and after many years of life's ups and downs and backwards and forwards? The society is still here, standing proud and tall and with a board of directors eager to serve you even better in the months and years ahead. There will be more articles and more news about bulbs, tubers, corms and rhizomes from distinguished plantspeople around the world as

your editorial board works to expand the contents and quality of HERBERTIA.

The society and its publications have changed in the past and they will continue to change in the future. We hope you like the changes. If you do like them, let us know. If you don't like them, be sure to let us know.

One of these planned changes is the startup of an International Bulb Society newsletter which will be published and sent to all subscribers in September. Your IBS newsletter will be published twice a year and will supplement your yearly journal, HERBERTIA, which will continue to be published midyear annually. Look for your first newsletter in September-October; it will include the Seed Exchange list. Another newsletter will be published and mailed during February-March.

Thank you all for your encouragement and for your support over the years, and especially during this last year. Never have the kindnesses of our readers, subscribers and contributors been so important to your board of directors and to the future of the International Bulb Society as in the last year.

My personal thanks go out to Charles Gorenstein, Dylan Hannon, Elisabeth Lassanyi, Alan Meerow and Michael Vassar, my fellow board members, without whose help and support the continuation of the International Bulb Society and HERBERTIA would not be possible.

I would also like to thank every writer and photographer who contributed an article or a photograph to any of the society's publications down through the years. What a wealth of plant lore from times gone by lives on in those publications! The stories on their pages can come to life for anyone who has plants in his or her heart. With just a little imagination, it's almost as though their authors and photographers were talking to us or showing us their gardens and plants today.

May each person reading these words take a moment to pay a special tribute to the memories of all those plantspeople and bulb lovers who preceded us in the work with bulbs, tubers, corms and rhizomes which we are now carrying forward.

May each of us reading these words pause for a moment and reflect on the rich heritage of sixty-two years of our society's work with bulbs and other plants rare and common.

To you, William Herbert, and to you, Dr. Hamilton Traub, thank you both. The torch you lit and kept alive so many years ago still burns brightly.

**THE ORIGINS OF *CLIVIA MINIATA*
'VICO YELLOW' AND 'VICO GOLD'**

Sir Peter Smithers
Vico Morcote, Switzerland

An article in the 1992 *HERBERTIA* by Terry Hatch about nerine breeding in New Zealand draws attention to the unfortunate practice of raising hybrids without preserving the records, if any, of their antecedents. To the commercial grower this may be of little consequence, but to the breeder it is a misfortune. As both of the yellow *clivias* raised here are now being used extensively for breeding in Japan and elsewhere, I feel that I should put on record what I have been able to discover about the origin of their seed and pollen parents and the curious history of these two clones. For much of the information which follows I am indebted to Mr. J.L.S. Keesing, Living Collections, Kew, and his staff.

THE FLOWERING PLANTS OF SOUTH AFRICA 11 (1931) shows a full page plate of *Clivia miniata* Regel var. *flava* Phillips var. *nova*; a *forma typica floribus flavis differt*. (National Herbarium Pretoria, No. 8724). It then goes on to state as follows:

"On Plate 13 we illustrated typical *Clivia miniata* as found in Natal. The illustration on the accompanying plate, also found in Natal, differs from the species in having yellow flowers. We received the specimen from Mr. B. Nicholson, S.S.O., of 'Mbabane, Swaziland who obtained the plant from Mr. C.R. Saunders of Melmoth, Zululand. Mr. Saunders informs us that one or two plants were found in the Eshowe Forest, Zululand, about the year 1888, and a number of plants have been propagated from these originals. Plants were propagated from seed but took many years before they flowered. Mr. Saunders also informed us that two or three years ago a plant flowered at the Royal Botanic Garden, Kew, but as far as we are aware has not been figured. The fact that all plants raised from seed have yellow flowers indicates that we are dealing with a pure strain; but except for the colour of the flowers we have not been able to obtain any tangible characters which would separate it from *C. miniata* and have, therefore, kept it as a yellow variety."

It is curious that the author did not mention the colour of the fruits. The fruits of *C. miniata* 'Kewensis Cream' are bright yellow and so are those of its two yellow progeny to which this article refers.

The origin of the yellow-flowered plants mentioned in the description above as flowering at Kew, apparently in the period 1920-30, is not clear from this text, but it may have been intend-

ed to imply that they were of similar origin to Mr. Saunders' plants, and this seems to be confirmed by what follows.

On 3rd January 1964 the late Hon. Lewis Palmer, Treasurer of the Royal Horticultural Society, whom I knew well as a meticulous plantsman, wrote as follows to Mr. Marais at Kew:

"When I visited him (Sir Charles Saunders, Administrator of Zululand) in October 1925 at his home near Eshowe he had several large tubs of it (the yellow clivia) in flower on his stoep. He kindly gave me two plants which I brought back to England and gave to my father-in-law, the late Lord Wakehurst. He gave one to Kew and kept the other. After consulting Sir Arthur Hill, Lord Wakehurst decided that the proper name for the plant was *Clivia citrina* or *Clivia miniata* var. *citrina*. Both plants flowered and Lord Wakehurst exhibited his at an R.H.S. meeting in 1927 or 1928 under one or other of those names. Both plants set seed and subsequently died". (My underlining.)

Mr. Palmer continued: "The seedlings in both cases reverted to the orange colours of *C. miniata*, but in both cases *C. miniata* had been present and in flower. This induced the late Mr. Raffill of Kew to endeavour to segregate back to the lemon colour by selfing the seedlings and selecting and I know that shortly before he died he had been successful and for some reason called the plant *C. miniata* var. *flava*. Whether it was the F₁, F₂ or F₃ generation I don't know. In the meantime I visited South Africa again in 1948 and was able to obtain another plant from a friend of Lady Saunders who had a stock in her garden. This flowered in my greenhouse and I selfed it without any other clivia being present and the resulting seedlings have come true to colour..."

In November 1970 I received clivias from Mr. Russell at Castle Howard under the names of 'Kewensis A', 'Kewensis B' and 'Kewensis Cream'. This material was received by him from Kew. It has been a practice for plants raised at Kew to be named "Kewensis", vide *Magnolia 'Kewensis'*. No doubt this would not now be admissible under the International Rules, which prohibit the latinising of hybrid names. However that may be, it is clear to me that what I received were three clones from Raffill's segregation program. 'Kewensis Cream' was therefore not *C. miniata* var. *citrina*, neither were clones 'A' and 'B' pure *C. miniata* var. *citrina*.

My plant of 'Kewensis Cream' flowered and produced seed in bright yellow berries. Its pollen had been used on clones 'A' and 'B' which were growing in the same greenhouse but were not segregated. Pollen-dabbing at its worst! My excuse: I did not take the cross seriously.

In due course the seedlings flowered, all producing colours in varying shades of orange with more or less yellow in the throat.

and widely varying forms. But there were no yellow flowers and no yellow capsules. However, at the time of potting the seedlings there were more than I could accomodate in my greenhouse devoted to nerines, so a quantity of seedlings were planted out, really thrown away, under the staging. In or about 1978, to my astonishment, one of these flowered with fine yellow blooms, certainly not inferior to 'Kewensis Cream', which were followed by yellow capsules. The plant prospered and I sent an offset to the late Dr. Shuichi Hirao, most eminent and generous of plantsmen, in Japan. He thought highly of it and sent me a plant of his yellow clivia, which was, I must say, far inferior in quality of flower. He told me that it had been obtained from the late Mr. Gordon McNeil in South Africa. In 1984 Mr. Les Hannibal wrote to me that he had also received a yellow clivia from Mr. McNeil which closely resembled the Hirao plant.

The next thing that I knew, my second astonishment in this story, was to receive a copy of the JOURNAL OF THE JAPAN HORTICULTURAL SOCIETY, No. 89, 1985 which figured my yellow clivia in colour on the cover. Inside was an extensive illustrated article on "Breeding of *Clivia* for Commerce" by Uema Tsu. The Japanese are the ultimate plantsmen, and I should have been alerted by this publicity to the fact that the plant was highly significant.

"Shu" Hirao lamentably died, still quite young. It was a couple of years later that I received a letter from Yoshikazu Nakamura, *Clivia* Breeding Plantation, 4-28 Kurodo, Mobara 297, Chiba Prefecture, Japan, saying that "Shu's" widow, attaching an importance to the plant which I had failed to do, had wisely given it to him. Might he have "permission to breed from Smithers Yellow, world's best yellow clivia, the one to beat". My third and final astonishment in this curious story — I replied that so far as I was concerned he was free to use the plant in any way he pleased, provided that the name would be 'Vico Yellow'. I fear this proviso may have come too late as I understand that the plant is already proliferating in Japan under the former name, 'Smithers Yellow'.

A plant of 'Vico Yellow' was also sent by me to Brooklyn Botanical Garden where some interest has been expressed in clivias.

Amongst other uses of 'Vico Yellow' made by Yoshikazu Nakamura is a crossing with some of the magnificent variegated leaf clivias, which transmit the variegation to seedlings. It must be admitted that whereas a clivia plant is spectacular for two weeks in the year, these wonderful variegated plants are spectacular for fifty-two.

In the same manner as above there subsequently flowered a second yellow seedling which is very similar to 'Vico Yellow' but it is too early to say whether it is superior. It is a very strong grower.

Here it should be noted that Lord Aberconway and his Garden Manager, Mr. F.C. Puddle, raised a series of *clivia* hybrids at Bodnant stated to be "between *Clivia miniata* var. *citrina* and the salmon *C. miniata*". An exhibit of these hybrids received a Gold Medal from the Royal Horticultural Society and on advice from the Society, two selections were assigned the names *C. x kewensis* "Bodnant Variety" and *C. kewensis* x "Bodnant Yellow".

This seemed to me misleading, suggesting that the Bodnant plants were raised from the Raffill [Kew] segregations. After further consultation with the Society I am advised as follows: "If one breeder (in this case Raffill) gives a horticultural collective name to his progeny of a particular stated infraspecific cross, it does not dictate that anyone else performing the same cross is bound to use the same collective name. Botanical collective epithets are generally only used for interspecific crosses and are binding on other workers. If Kewensis Group is to be used to cover plants ultimately derived from the work of Raffill at Kew then it would indeed be inappropriate for this collective name to be used for the Bodnant plants — assuming their yellow flowered plant was not one of Raffill's introductions. If it is really needed, then they would require a separate collective name."

In the light of the above I intend registering *Clivia x kewensis* 'Vico Yellow' and *Clivia x kewensis* 'Vico Gold' with the Registrar of Amaryllids.

In my opinion, to avoid confusion amongst breeders, a separate name is indeed needed for the Bodnant plants. This seems all the more appropriate in view of the fact that the late Lord Aberconway, then President of the Royal Horticultural Society, did not consider that his plants should be included in 'Kewensis'. In my opinion he was right.

So this story, beginning in "colonial" South Africa in the old world of Lords and Ladies, Knights, Administrators and Honourables, ends up in modern Japan. It is a happy ending. The painstaking work of segregation by Charles Raffill, a very distinguished hybridist in other fields, particularly magnolia, has finally been preserved and rewarded, quite by accident, and without any merit at all on my part!

Postscript June 1995: *Clivia x Kewensis* 'Vico Yellow' has been registered in Japan by Miyoshi & Co., 3181-Takeahara, Kamisasae, Kobuchizawa, Kitagoma-gun, Yamanashi, Japan 408, and is being distributed by them from tissue culture.

A MOST UNDERAPPRECIATED GENUS — OXALIS: SOME WESTERN CAPE SPECIES

Michael Vassar
Van Nuys, California, United States of America

Just mention the word "oxalis" and most plant growers cringe. A pandemic weed and a few weedy species have maligned a whole genus containing hundreds of wonderful flowering bulbs. The nasty weed *Oxalis corniculata* is now found in all areas of the world where plants are cultivated. This weed can flower and set seeds when the plant has only a couple of leaves; more mature plants produce thousands of seeds which are thrown in all directions when the aril explosively propels the seeds from the fruit, thus maintaining and perpetuating its lowly status.

The genus *Oxalis* contains over 800 species, with most species in South and Central America. *Oxalis* has a wide distribution over the rest of the world, especially in South Africa, where the second largest concentration of species is found. In South Africa the distribution is mainly in the Western Cape Province, a Mediterranean climate area with cool but not normally freezing winter nighttime temperatures and winter rainfall from storms lasting from a few to many days interspersed with relatively warm sunny days. Species from the Eastern Cape Province are also winter growing and summer dormant, but tend to have a longer growing season. This area normally gets sporadic rainfall throughout the year, but there may be summer periods of little or no rainfall for up to a few months at a time.

In the eastern parts of South Africa the rainfall occurs during summer; winters are dry and relatively cool, with frost common in many areas, especially in the higher altitudes. *Oxalis* species are dormant in winter in these areas.

Only a few *Oxalis* species are presently in cultivation in the United States. *O. adenophylla*, a rock garden species from Chile and Argentina is occasionally listed in catalogs. *Oxalis brasiliensis*, from Brazil, has become available recently but is not long lasting in cultivation. *Oxalis corymbosa* (*O. martiana* var. *aureoreticulata*), grown for its gold-veined leaves, can be found occasionally. Bulbs of *O. deppei* and *O. lasiandra*, both from Mexico, are available yearly from sources in The Netherlands. From Brazil, *O. regnellii* is readily available, being grown for its interesting, sharply angular leaves; it is a novelty and easy to grow but the flowers are not showy. Three species from the Western Cape area of South Africa are available from commercial sources and are

grown as flowering potted plants, mainly in the northeastern states: *O. hirta*, *O. purpurea* and *O. versicolor*. Another species, *O. bowiei*, from the Eastern Cape, is available commercially for potted flowering plants. In autumn, bulbs grown commercially in California of *O. purpurea* are sold under the name "Grand Duchess" in colors of lavender, pink or white. These cultivars are reliable and colorful and dormant bulbs are relatively inexpensive. A red leaved form has recently been distributed and can be found occasionally in Southern California.

The most showy and exciting *Oxalis* species are from the winter rainfall areas of the Western Cape Province. Many of these species are quite variable, having differing leaves and flower colors and they can be extremely difficult to identify as to species. The following species are some that should and could be brought into cultivation.

O. adnodes — plants produce rosettes of leaves that are low and dense. Large white flowers with a yellow center are produced from late winter to spring. From northern Namaqualand.

O. annae — small plants, flowers copper-pink or yellow, flowering late winter to early spring. From the Karoo and Namaqualand.

O. aurea — loose rosettes of leaves with pubescent petioles. The brilliant yellow flowers are produced late autumn to early winter. Native to Clanwilliam District.

O. clavifolia — small plants with upright stems are covered with tiny leaves, looking moss-like. Flowers are gold to brilliant yellow and are produced midwinter to spring. Native habitat is from Vanrhynsdorp to Kamieskroon.

O. compressa — a large, robust plant with a low rosette of leaves; the leaves of some forms have a purplish or red zone near the center of the leaf. The showy flowers are yellow and held well above the leaves in clusters of 2 to 7 flowers and are produced late winter to mid spring. It is relatively common in Namaqualand.

O. convexula — small plants, with leaf rosettes in dense, mounding tufts. The tiny leaves are thick and almost succulent. The showy flowers are rosy salmon with a yellow throat and are produced from midwinter to spring. Some forms I have grown produce masses of tiny bulbs in the growth tips just after flowering and could become weedy in mild winter areas.

O. eckloniana — a very polymorphous species. Leaves are in low rosettes; many forms have leaves with purple undersides. Relatively large flowers are produced in abundance and can be found in many colors: lavender, rose purple, violet pink, white and orange, flowering mainly from late autumn to late winter. It is

common in the Cape Peninsula.

O. luteola — the leaf rosettes are low and dense. The leaves are thick and usually dark green with a dark reddish underside. The large, showy flowers are bright yellow to golden yellow and are produced from mid to late winter. Containers of this species in full flower are extremely showy.

O. namaquana — this beautiful and unusual plant has low rosettes of large leaves, each leaf having three leaflets that are rather long and narrow. The very large flowers are bright yellow and held just above the leaves. It flowers from midwinter to spring. It has a rather limited distribution, being found only in an area near Nieuwoudtville.

O. obtusa — this is truly one of the wonders in the genus. From small, dense rosettes of somewhat fuzzy leaves, masses of showy flowers are produced from mid winter to late spring. Flower color varies through pink, copper pink, red, salmon, pale yellow to orange, all with a large yellow center; many have contrasting veins in the petals of a darker color. This species must have full sun as it deteriorates rapidly to a floppy mess when grown in low light. It has a wide distribution in the Western Cape. Plants I have grown are good bulb producers.

O. polyphylla — another of the variable species, this one has many named forms, being widespread throughout Cape Province. The flowers are pretty but not really showy. It is mainly grown for the ferny leaves. One form which I grow (I think it is *O. polyphylla* var. *heptaphylla*) has leaves that are succulent, usually with seven leaflets per leaf, the plant looking like a mound of succulent threads.

O. purpurea — the forms of this species now in cultivation seem to be the dullest flowered of those found in all its normal distribution area from Steinkopf in northern Namaqualand down through most of the Cape Peninsula. When grown in bright light and a relatively poor, sandy and gravelly soil, the best forms can be spectacular with their large showy flowers and tight rosettes of leaves. Flowers can be found in many shades of pink, rose, salmon, white, violet to purple and glowing yellow. This species has a long flowering period from mid winter through spring. Some forms have the leaves mottled irregularly with burgundy blotches.

O. zeekoevleyensis — this wonderful small plant with a fairly wide distribution in the Cape Peninsula produces a dense, low rosette of leaves and large, pink flowers with a small, yellow center. It flowers from midwinter to midspring.

In order to simulate and replicate the soils of the South Africa Western Cape which are mostly a slightly acid, decomposed sand-

stone, all should be grown in a relatively poor soil mix composed of mostly sand, silt and small gravel, with less than 10% organic matter added. When grown in a rich, organic planting mixture, if the bulbs don't rot, the plants will grow very large and floppy, totally losing their natural character. Give all the sunlight possible — this is very important as in low light oxalis etiolate and become unsightly. Good air circulation is essential, especially when grown in areas with high humidity or in an enclosed environment. These *Oxalis* grow happily with temperatures of 40-45°F [4-8°C] at night (not over 55°F [13°C]) and daytime temperatures of 60-70°F [16-21°C]. Cool temperatures will keep them growing and flowering; warmer temperatures, especially if plants get even slightly dry, will often make plants go dormant prematurely. Fertilize every 3-4 weeks, if at all, with a weak, liquid fertilizer that is low in nitrogen. Do not overfertilize or plants will not stay compact and tight. I have found that plants grown in a too-rich mix and/or overfertilized do not produce so many bulbs as those grown in a sand and gravel mixture, with little or no fertilizing. Overfed plants and plants in a too-rich planting mix seldom produce many flowers, they just produce leaves.

Bulbs of many species grow deeply so they should be grown in pots that are at least 5 inches (13cm) deep. Plant bulbs 1 inch (2.5cm) deep in September to October (northern hemisphere). [Many species from the Eastern Cape will begin to sprout as early as late July but if planted early they get set back by the late summer heat and don't grow well until the cool nights of autumn.] As spring approaches, the earliest Western Cape species will begin to go dormant with leaves beginning to yellow, especially if the days are getting warm and the pots have gotten at all dry. When this happens gradually diminish watering until plants get no water in 2-3 weeks. Let them dry for a few weeks in their pots in a sunny location. Bulbs from the Eastern Cape often flower into mid summer before going dormant. Store dormant bulbs in a dark, warm, dry location with some air circulation. The storage location should be secure — here in Southern California squirrels and mice love to eat oxalis bulbs, and elsewhere there undoubtedly will be other hungry critters.



Oxalis obtusa, a color form from the southern end of the bold and spectacular Seweweekspoort.



Oxalis luteola from east of Nieuwoudtville, this plant has a long flowering season.



Oxalis sp. from the Anenouspas. Flowers are 7cm across and are produced in abundance.



Oxalis polyphylla var. *heptaphylla* from the Gifberg Mountains. This is a most variable species.



Oxalis obtusa, an intense color form from between Sutherland and Middelpos.



Oxalis purpurea, form from the Pakhuispas with blotched leaves.

Photos: Michael Vassar

POLYXENA AS POT PLANTS

Richard L. Doutt

Santa Barbara, California, United States of America

In Greek mythology Polyxena was the daughter of Hecuba and her husband Priam was the last king of Troy. When Troy fell, Polyxena was claimed by the ghost of Achilles as his share of the spoils and she was put to death at his tomb. I much prefer the post-classical version which is far less grim. It involves a love affair between Polyxena and Achilles, the greatest of the Greek warriors. *Polyxena* is now the name of a geophytic genus comprised of two quite variable species of dwarf plants found only in the Cape Province of South Africa (Jessop, 1976). It is a member of the plant family Hyacinthaceae, a segregate of the Liliaceae, and is related to the genera *Massonia* and *Whiteheadia*.

Polyxena ensifolia is widespread in the drier areas of the Cape Province where it grows in both sandy and clay soils in open spaces and among rocks. The flowers have long perianth tubes and range in color from white to pink to mauve. This variability is beautifully illustrated by the artist Barbara Jeppe (1989) in her recent book, *SPRING AND WINTER GROWING BULBS OF THE CAPE*. The flowers are fragrant so it is not surprising that one synonym of *P. ensifolia* is *P. odorata* and another, because of the small plant size, is *P. pygmaea*.

The plants usually have two leaves that are initially prostrate with the cluster of stemless flowers in the center, reminiscent of the growth form of *Massonia*. As the flowers mature, the leaves, which are about one inch wide and four inches long, become semi-erect. The clone I grow out of doors in Santa Barbara, California, has waxy-appearing white flowers. The outer flowers of the cluster open first, thus forming a striking, white ring on the dark leaf background that is truly charming. The blossoms continue to open towards the center of the ring and in a few days the plant has a central mound of numerous flowers.

Polyxena corymbosa, which is not so earth-hugging and has semi-erect to erect, narrow leaves, is the other species in the genus. The flowers vary from white to pale pink. The species is not so widespread as *P. ensifolia* and is now rather rare according to Jeppe (1989). It is more easily grown than *P. ensifolia* but is not so attractive as its relative and is, I think, only an item for the ardent collector of bulbs.

Polyxena flower during autumn in their native South Africa which is the period of April to June and similarly are autumn

flowering in Santa Barbara from mid-October through November to early December. *Polyxena* are best treated as pot plants that can be lifted to eye level for close observation. Otherwise, in nature they are "belly plants" at the soil surface for inspection by the field botanist.

I grow *Polyxena* in a sandy mix. As is the case with all Cape bulbs, they insist on good drainage and a dry summer. These requirements are non-negotiable. Both species need a sunny location. DuPlessis and Duncan (1989) suggest that the small, fleshy bulbs be planted close together just below the soil surface in low containers for an effective show. Propagation is by offsets or by seeds which are produced in abundance and best sown in October or November. The flowers may appear in the second season, but for me they usually appear in the third year. Their range in the Cape Province as reported by Bond and Goldblatt (1984) would suggest that they are probably tender plants which need some protection from severe frosts.

LITERATURE CITED

- Bond, Pauline and Peter Goldblatt. 1984. Plants of the Cape Flora. JOURNAL OF SOUTH AFRICAN BOTANY, supplement to volume 13.
- DuPlessis, Niel and Graham Duncan. 1989. BULBOUS PLANTS OF SOUTHERN AFRICA. Tafelberg, Cape Town.
- Jeppe, Barbara. 1989. SPRING AND WINTER FLOWERING BULBS OF THE CAPE. Oxford University Press, Cape Town.
- Jessop, J.P. 1976. Studies in the bulbous Liliaceae in South Africa: 6. JOURNAL OF SOUTH AFRICAN BOTANY 42(4):406-426



Figure 1. *Polyxena ensifolia*'s first flowers forming an outer ring of flowers.



Figure 2. *Polyxena corymbosa* displaying narrow leaves.

Photos: Richard Douth

THE CORRECT NAME OF THE YEMENI CRINUM (AMARYLLIDACEAE)

F. Nigel Hepper, Kew Gardens, England

The beautiful, pure white *Crinum* that grows in wet places in the Yemen highlands has been known as *C. yemense* Deflers (1889, p. 209). Deflers found it at an altitude of 2300-2600m at a Shibam (Shibam) near Menâkhah, based on his gathering No. 335 and an unnumbered specimen, both in the Paris Herbarium.

By coincidence in October 1975, I found it near another Shibam about 49km northeast of Sanaa at an altitude of 2,400m. It was growing as a large clump beside an irrigation channel in a fruit orchard near the town, but there were also scattered individuals on the cliffs above the town. As its bulbs were too deep to dig up with a trowel, I made herbarium specimens (Hepper 5777) for Kew of the fragrant white flowers clustered at the end of the 1m long stalk.

Recently I received on loan from Copenhagen Herbarium an overlooked specimen collected in Yemen by P. Forsskål before his death in 1763. Forsskål named and described his collections day by day, so after his death his numerous notes were preserved, collated and eventually published in 1775. On page 209 there appears the name *Amaryllis alba* and a brief description: *foliis linearilanceopatis; flore albo. Spatha 10-flora, floribus declinis*. The locality of collection was Kurma, now known as Kusma, and the Arabic name was given as *Soraj*.

When Herbert wrote his treatise on Amaryllidaceae (1837 p. 272), he realised that *Amaryllis alba* was a *Crinum*, but since he had not seen Forsskål's type specimen he considered it to be a doubtful species. Yet he wrote "I can scarcely doubt that this plant, with ten white flowers, must be a *Crinum*, and from its abode in Arabia, it is probably distinct from all that have been described". I, therefore, accept the combination *C. album* (Forssk.) Herb. There is no doubt, however, that this is the same species that Deflers called *C. yemense*, which must now give way to *C. album*. Whether the Yemen plant is identical with that in Ethiopia or the other side of the Red Sea remains for further research. The Ethiopian plant is known as *Crinum abyssinicum* Hochst. ex A. Richard (1848, vol. 2, p. 311), which Deflers distinguished from *C. yemense* by its having more numerous flowers (10-20) and by the larger size of the flowers (perianth 20-22cm long). Incidentally, Deflers should have called it *C. yemenense*, not *C. yemense*.

This study is part of my revision of the entire collection made

by Forsskål during the Royal Danish Expedition from which only Carsten Niebuhr returned alive. As my revision will take some time to be published in Kew BULLETIN ADDITIONAL SERIES, my distinguished colleague Brian Mathew advised that a separate notice of the change of name would be of interest to readers of this journal.

LITERATURE CITED

- Defflers, A. 1989. VOYAGE AU YEMEN. Paris.
Forsskål, P. 1775. FLORA AEGYPTIACO-ARABICA. Copenhagen.
Herbert, W. 1837. AMARYLLIDACEAE. London.
Richard, A. 1848. TENTAMEN FLORAE ABYSSINICAE. Paris.



Crinum album (Forssk.) Herb. Photo by F.N. Hepper

A NEW RESOURCE FOR GEOPHYTE INFORMATION

Additional publications dedicated to bulbs of the world are always most welcome. Brian and Margaret Mathew, lately of Kew Gardens, have originated and publish THE BULB NEWSLETTER. It is a wonderful newsletter, out of the United Kingdom, which has twenty information-packed pages per issue, with four issues published per year. This publication would make a fine addition to the library of any bulb enthusiast.

For additional information write to: THE BULB NEWSLETTER, 90 Foley Road, Claygate, Esher, Surrey KT10 ONB, United Kingdom.

RHODOPHIALA LAETA PHILLIPPI, A BEAUTIFUL AMARYLLID FROM NORTHERN CHILE

Luis Arriagada and Otto Zöllner, Catholic University,
Avenida Brasil 2950, Casilla 4059, Valparaiso, Chile

Central Chile (Latitude 28°-37° S.) has an exceptionally privileged climate for the existence of bulbous plants. After a short, rainy winter that is not very cold, there follows a long drought without any rainfall during 7-10 months. In springtime our slopes and lanes are covered with multicoloured flowers. There are areas covered with red flowering bulbous plants, others with yellow or white ones. These flowering plants belong to different genera such as *Rhodophiala*, *Hippeastrum*, *Phycella*, *Leucocoryne*, *Pabellonia*, *Placea*, *Alstroemeria*, etc.

Switzerland uses diffuse propagandistic booklets which show meadows and lanes covered with narcissus and crocus to attract visitors and tourists to admire these beautiful flowers. Chile has no reason to envy this distant land as the Chilean bulbous flora is more varied and more abundant in genera and species.

One of the most beautiful bulbous plants, nearly unknown by botanists, is *Rhodophiala laeta* which grows on the slopes of the Coastal Range. This precious plant grows in the II Region of Chile, really a desertic region, but these mountains near the coast have a height of more than 1000 meters and their summits are always covered with fog, popularly named Camanchaca, which brings the necessary moisture for the vegetation. *Rhodophiala laeta* has red tepals widely extended and several flowers on the same stem. Following is a complete botanical description of the plant.

***Rhodophiala laeta* Philippi.**

Family: Amaryllidaceae

Tribe: Hippeastreae

FLORA ATAC. 51: No. 368, 1860.

Bulbous herb to 40cm high; the shape of the bulb is pear-like, covered with brown or black scales, but not with fibres; bulb height is 2.5-3cm and the diameter is 2.6-3.2cm; the bulb disk is 1.1-1.4cm wide. The neck of this herb or subterranean part of leaves and stem is 3.5-11cm long. There are only basal leaves, lineal shaped, 3-4.5mm wide, up to 37cm long, fleshy, margins of the leaf duplicated to the abaxial side. Stem erect, 33-37cm high, glabrous, the diameter of the stem is 5-10mm wide, the stem is not cylindric, it is elliptic. Inflorescence with 6 or 7 flowers, umbel-like; there are 2 spathal bracts on the base of the pseudo-umbel, their shape is lanceolate, membranaceous with straw-like

colour and an acute apex and many parallel veins, 4-6 x 1.2-1.4cm. All flowers are pedicellated, pedicels cylindric, 4.5-5cm long, each pedicel provided on its base with a small bract. Flowers formed by 3 + 3 tepals, these extended or curved backwards, red to purple in colour, tepals 4.8-5.2 x 1.5-2cm; 6 stamens, adhered on the base of the flower, the filaments of the episepals 2-3cm long, those of the epipetals 3.5-4cm long, anthers versatile, with yellow colour. Style slightly longer than the stamens, three-lobed. The ripe fruit is a capsule 1.4-1.6 x 1.6-1.7 cm, reddish coloured, dehiscent, of three loculocid carpels with about 40 seeds. Seeds are of samara type, laterally compressed, each seed surrounded by a transparent membrane 4.5-5 x 6.2-8mm, seeds very light; the weight of 50 seeds is about 0.1 gram.

Rhodophiala laeta Phillipi. grows in the II Region of Chile, in former times named province Antofagasta. This region is really an absolute desertic area. Generally no rainfall happens during the seasons of the year. But parallel to the coast are the ranges of the Coastal Cordillera Mountains which often are at an elevation of more than 1000 meters, so the humid air streams coming from the Pacific Ocean are condensed, forming thick fogs about the coast during all the year. These fogs cover the range between 400-800 meters, bringing humidity to these slopes. An abundant and rich flora with many endemic species was formed in this small strip. A North American botanist, I.M. Johnston, during the years 1926-1929, studied this flora and published the result in CONTRIB. GRAY HERB. LXXXV. Here also grows our *Rhodophiala laeta*. On two distant spots we could collect fruits and seeds: in the north of Antofagasta in Quebrada La Chimba and near Paposo. The flowering and fruiting period occurs in the late spring month of November.





Rhodophiala laeta, flowering plant in habitat.



Rhodophiala laeta flowers in the botanical garden nursery

Author photos

Photo opposite page shows one of the authors with *Rhodophiala laeta* in habitat in Chile.

Bletilla striata is a most dependable orchid that is grown from tubers. See the article on page 107.

Photo: M. Vassar



PRODUCTION OF TRIPLOID AND TRISOMIC PLANTS IN JAPANESE GARDEN IRIS, *IRIS ENSATA* THUNB.

Tsutomu Yabuya, Takao Sushida and Taiji Adachi,
Faculty of Agriculture, Miyazaki University, 1-1 Gakuen-
Kitanadai-Nishi, Miyazaki 889-21, Japan

Contributions of the Laboratory of Plant Breeding,
Faculty of Agriculture, Miyazaki University

ABSTRACT

In Japanese garden iris, *Iris ensata*, triploids and trisomics were first produced through the reciprocal crosses between the diploid cultivar 'Shishinden' and the tetraploid cultivar 'Raspberry Rimmed' and between the diploid and the triploids. The characteristics of the triploids obtained were examined. As the triploids, two eutriploids ($2n=36$) and one hypotriploid ($2n=35$) were obtained from the cross of the diploid by the tetraploid, the size of the outer perianths of the triploids were intermediate between that of parental plants and the triploids showed the tendency of late flowering in comparison with the parental plants. Moreover, the triploids bore strong resemblance to the parental plants in the expression of anthocyanins, although the color of their outer perianths was similar to the diploid parent. Finally, the reciprocal crosses between the triploids and the diploid proved that the triploids are an important source to obtain trisomics of *I. ensata*.

INTRODUCTION

Japanese garden iris, *Iris ensata* Thunb. has been extensively developed as a modern plant. It is used commonly as cut flowers and potted plants and also as a garden plant in Japan. As reported by Tomino (1963), there are 22 aneuploid cultivars ($2n=25$) in the 1se line of this species and these cultivars exhibit an attractive flower type. In addition, Yabuya et al. (1989, 1992) proposed that the aneuploid cultivars were partial trisomic plants of a pair of the second longest *m* chromosomes in the eudiploid cultivars ($2n=24$). Therefore, the production of such trisomics is necessary not only to prove that the proposal is right but also to breed the attractive flower type of *I. ensata*. Moreover, aneuploids, particularly trisomics, have been useful in studying the genetics of ornamental species, and all the primary trisomics have been produced in snapdragon (Sampson *et al.* 1961), stock (Matsuoka 1973) and petunia (Maizonnier 1984). However, studies on the production of aneuploid plants such as monosomics, trisomics, teleocentrics

and so on have not yet been made in *Iris ensata*.

Triploids are the best and the most dependable sources of primary trisomic series in plant species (Khush 1973). In this study, triploid and trisomic plants of *I. ensata* were first produced through the reciprocal crosses between a diploid and a tetraploid and between the diploid and the triploids, and the characteristics of the triploids were examined.

MATERIALS AND METHODS

The following 2 cultivars and 3 triploids of *Iris ensata* Thunb. var. *ensata* (Makino) Nakai (= *I. kaempferi* Sieb. var. *hortensis* Makino) were used as plant materials: 'Shishinden' ($2n=24$) as a diploid cultivar, 'Raspberry Rimmed' ($2n=47$) as a tetraploid cultivar and 'T-1' ($2n=36$), 'T-2' ($2n=36$) and 'T-3' ($2n=35$) as triploids. As mentioned later, these triploids were obtained from the cross of 'Shishinden' x 'Raspberry Rimmed'.

The reciprocal crosses between the diploid and the tetraploid and between the diploid and the triploid of *I. ensata* were made by the method of Yabuya and Yamagata (1978). Among all these crosses, only the cross combination of 'Shishinden' x 'T-1' was applied to embryo culture to obtain the hybrid plants. The method of embryo culture has already been described (Yabuya 1984). In addition, the somatic chromosome numbers of all hybrid plants obtained from the above crosses and their parental plants were counted by the aceto-carmin squash method according to Yabuya (1991b).

The characteristics of triploids of *Iris ensata* were examined in comparison with those of their parental cultivars. Characters investigated were flowering date, pollen fertility, size and color of outer perianths and their anthocyanins. Pollen fertility of each plant was determined by the percentage of well stained aceto-carmin pollen grains for ones collected at anthesis. The fully expanded outer perianths of each plant at anthesis were harvested to extract their anthocyanins. Preparation of anthocyanin samples for high-performance liquid chromatography (HPLC), HPLC analysis and the identification procedures of anthocyanins were made by the methods of Yabuya (1987, 1991a).

RESULTS AND DISCUSSION

Table 1 shows the reciprocal crossability between the diploid cultivar 'Shishinden' and the tetraploid cultivar 'Raspberry Rimmed' of *Iris ensata*. The hybrid plants were obtained in the cross of the diploid x the tetraploid, although the reciprocal cross gave higher numbers of hybrid seeds than the former cross. For

four of the surviving hybrid plants the somatic chromosome numbers were checked: two plants for $2n=36$ (eutriploid, Figure 1A, B), one plant for $2n=36$ (hypotriploid, Figure 1C) and $2n=46$. These triploid plants were called 'T-1', 'T-2' and 'T-3', respectively (Figure 1), and this is the first report of producing triploids in *Iris ensata*.

The characteristics of the triploids were examined and compared with those of the parental plants. The results obtained are in Tables 2 and 3 and Figures 2 and 3. As seen in Table 2 and Figure 2, the size of the outer perianths of the triploids was intermediate between that of the parental plants, and the triploids showed a tendency of late flowering in comparison with the parental plants. Moreover, the triploids exhibited a considerably high pollen fertility in spite of their triploidy (Table 2).

The triploids were characterized by 25 anthocyanins, and four of these anthocyanins were identified by comparison with known samples using the visible λ max and co-chromatography: peak 4=petunidin 3-rutinosido-5-glucoside (petunidin 3RG5G), peak 7=malvidin 3-rutinosido-5-glucoside (malvidin 3RG5G), peak 18=petunidin 3-(p-coumaroyl)-rutinosido-5-glucoside (petunidin 3RGac5G) and peak 20=malvidin 3-(p-coumaroyl)-rutinosido-5-glucoside (malvidin 3RGac5G) (Table 3, Figure 3). Table 3 indicates that the triploids bore strong resemblance to the parents in the expression of anthocyanins, although color of their outer perianths was similar to that of the diploid parent (Table 2, Figure 2).

Malvidin 3RGac5G (peak 20) and petunidin 3RGac5G (peak 18) were major anthocyanins in the parental plants and the triploids, because both anthocyanins accounted for 64.2 ('T-3') - 76.5% ('T-1') of total anthocyanins detected in these plants (Table 3, Figure 3). Therefore, these plants were classified into malvidin 3RGac5G - petunidin 3RGac5G type due to order of major anthocyanins, and this type is regarded as the basic one of *I. ensata* (Yabuya 1991a).

As shown in Table 4, the reciprocal crosses between the diploid cultivar 'Shishinden' and the triploids of *I. ensata* produced almost equal numbers of hybrid plants (Table 4). However, the germination rate of hybrid seeds was 26.2% for the diploid x the triploids and 14.8% for the triploids x the diploid, respectively (Table 4). When embryo culture was applied to the cross of the diploid x 'T-1' to increase germination rate, the frequency of plants obtained rose to 63.6% (Table 5). Thus, the embryo culture proved effective for the cross of the diploid x the triploid.

Table 6 presents somatic chromosome numbers in hybrid plants obtained from the reciprocal crosses between the diploid cultivar 'Shishinden' and the triploids of *I. ensata*. The somatic

chromosome numbers of hybrid plants obtained varied from $2n=23$ to $2n=31$, with noticeable numbers being $2n=23$ (monosomic, Figure 4A), $2n=24+t$ (telotrisomic, Figure 4B) and $2n=25$ (trisomics, Figure 4C, D) and trisomics were produced through both crosses (Table 6). This indicates that the triploids are an important source to produce trisomics of *I. ensata*. The identification and characterization of the trisomics obtained should be made by further studies.

As well as the triploids, such aneuploid plants as $2n=36$, $2n=27$, $2n=28$, $2n=29$ and $2n=31$ (Table 6) may be expected as useful materials to produce trisomics. *Iris ensata* may become one of the genetically well known species when all the primary trisomics are produced by using these materials. Finally, it also must be emphasized that the breeding of this species can never be successful without a deep, basic knowledge.

LITERATURE CITED

- Khush, G.S. (Ed.) 1973. CYTOGENETICS OF ANEUPLOIDS. Academic Press, New York.
- Maizonnier, D. 1984. CYTOLOGY. pp. 21-33 in K.C. Sink (ed.). *Petunia*. Springer-Verlag, Berlin.
- Matsuoka, K. 1973. On the trisomic plants of stock, *Mathiola incana* R. Br. JAPAN. J. BREED. 23 (suppl.): 158-159 (in Japanese)
- Sampson, D.R., A.W.S. Hunter, and E.C. Bradley, 1961. Triploid x diploid progenies and the primary trisomics of *Antirrhinum majus*. CAN. J. GENET. CYTOL. 3: 184-194.
- Tomino, K. 1963. Studies on the genus *Iris* in Japan especially cytotaxonomy of the genus and breeding of *Iris ensata* Thunb. BULL. LIB. ART DEP. Mie Univ. 28: 1-59 (in Japanese with English summary).
- Yabuya, T. and H. Yamagata, 1978. Embryological and cytological studies on seed development after reciprocal crosses between *Iris sanguinea* Hornem. and *I. laevigata* Fisch. JAPAN. J. BREED. 28: 211-224.
- Yabuya, T. 1984. Fundamental studies on the interspecies cross-breeding of *Iris ensata* Thunb. BULL. LAB. PLANT BREED. Fac. Agr. Miyazaki Univ. 4:1-111 (in Japanese with English summary).
- Yabuya, T. 1987. High-performance liquid chromatographic analysis of anthocyanins in induced amphidiploids of *Iris laevigata* Fisch. x *I. ensata* Thunb. EUPHYTICA 36: 381-387.
- Yabuya, T., H. Kikugawa, and T. Adachi, 1989. Karyotypes and chromosome association in aneuploid varieties of Japanese

garden iris, *Iris ensata* Thunb. EUPHYTICA 42: 117-125.

Yabuya, T. 1991a. High-performance liquid chromatographic analysis of anthocyanins in Japanese garden iris and its wild forms. EUPHYTICA 52: 215-219.

Yabuya, T. 1991b. Chromosome associations and crossability with *Iris ensata* Thunb. in induced amphidiploids of *I. laevigata* Fisch. x *I. ensata*. EUPHYTICA 55: 85-90.

Yabuya, T., H. Kikugawa, I. Aiko, and T. Adachi, 1992. Cytological studies of hybrids between aneuploid and eu-diploid Japanese garden iris (*Iris ensata* Thunb.). CYTOLOGIA 57: 253-257.

Table 2. Comparison of traits among the diploid cultivar 'Shishinden', the tetraploid cultivar 'Raspberry Rimmed' and triploids of *Iris ensata*

Plants	Outer perianths	Color	Flowering date (Month/day)	Pollen fertility ¹ (%)
	Size (length x width in mm)			
'Shishinden'	84.3±1.1 x 68.2±2.4	Reddish purple	June 10	89.5
'Raspberry Rimmed'	117.6±1.4 x 85.0±2.2	White with light reddish purple margin	June 9	85.4
T-1' ²	110.5±1.0 x 92.5±1.6	Reddish purple	June 5	66.8
T-2'	97.4±1.2 x 75.3±1.2	Reddish purple	June 17	59.3
T-3'	99.4±1.4 x 83.2±1.6	Reddish purple	June 18	74.4

¹ A thousand pollen grains were observed.

² The triploids were obtained from the cross of 'Shishinden' x 'Raspberry Rimmed'.

Table 5. Plant induction through embryo culture in the diploid cultivar 'Shishinden' x the triploid 'T-1' of *Iris ensata*

Number of embryos cultured	Shoot induction rate (%)	Root induction rate (%)	Plant induction rate (%)
11	63.6	63.6	63.6

Table 6. Somatic chromosome numbers in hybrid plants obtained from reciprocal crosses between the diploid cultivar 'Shishinden' and triploids of *Iris ensata*

Cross	Number of plants examined	Somatic chromosome numbers (2n)								
		23	24	24+t ¹	25	26	27	28	29	31
Diploid x Triploid ³	8	1(1) ²	3(1)	1	2(1)	1				
Triploid x Diploid	22		3		9	4	2	2	1	1

¹ Telocentric chromosome.

² () shows hybrid plants obtained by embryo culture.

³ See Table 2.



Figure 1. Somatic chromosomes in root-tip cells of triploid plants obtained from the diploid cultivar 'Shishinden' x the tetraploid cultivar 'Raspberry Rimmed' of *Iris ensata*. Top: 'T-1' (2n=36). Center: 'T-2' (2n=36). Bottom: 'T-3' (2n=35).

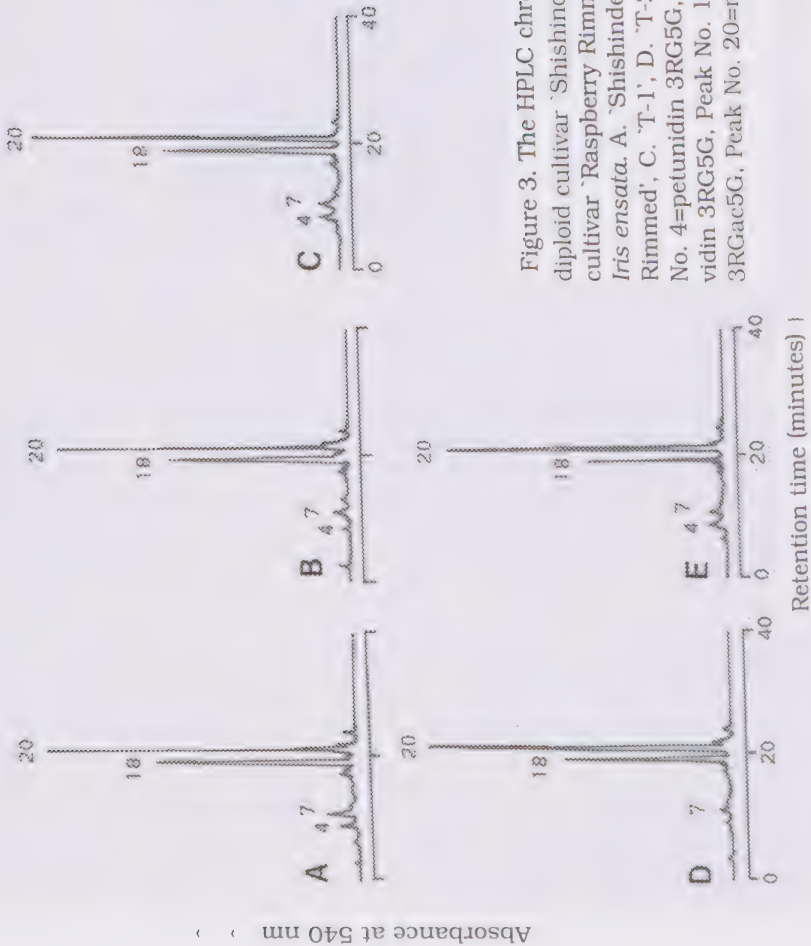


Figure 3. The HPLC chromatograms of the diploid cultivar 'Shishinden', the tetraploid cultivar 'Raspberry Rimmed' and triploids of *Iris ensata*. A. 'Shishinden', B. 'Raspberry Rimmed', C. 'T-1', D. 'T-2', E. 'T-3, Peak No. 4=petunidin 3RG5G, Peak No. 7=malvidin 3RG5G, Peak No. 18=petunidin 3RGac5G, Peak No. 20=malvidin 3RGac5G.

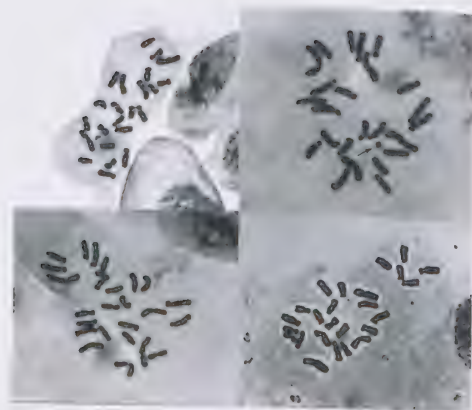


Figure 4. Somatic chromosomes in root-tip cells of aneuploid plants obtained from the reciprocal crosses between the diploid cultivar 'Shishinden' and the triploids of *Iris ensata*. Top left: $2n=33$ (monosomic), Top right: $2n=24+t$ (telotrisomic, an arrow shows a telocentric chromosome), Bottom left and right: $2n=25$ (trisomics).

Table 1. The reciprocal crossability between the diploid cultivar 'Shishinden' and the tetraploid cultivar 'Raspberry Rimmed' of *Iris ensata*.

Cross	No. of flowers pollinated	% of capsules obtained	No. of seeds per flower		Germination rate (%)	Germinated seeds per flower
			Total	Normal		
Diploid x Tetraploid	62	67.7	14.5	0.5	18.8	0.10
Tetraploid x Diploid	40	82.5	38.3	0.1	0.0	0.0

Table 4. The reciprocal crossability between the diploid cultivar 'Shishinden' and triploids of *Iris ensata*.

Cross	No. of flowers pollinated	% of capsules obtained	No. of seeds per flower		Germination rate (%)	Germinated seeds per flower
			Total	Normal		
Diploid x Triploid ¹	77	20.8	2.1	0.5	26.2	0.15
Triploid x Diploid	118	71.2	22.2	1.5	14.8	0.22

¹ See Table 2.

Table 3. Comparison of anthocyanins among the diploid cultivar 'Shishinden', the tetraploid cultivar 'Raspberry Rimmed' and triploids of *Iris ensata*.

Peak No.	Plants ¹	1	2	3	4	5	6	7	8	9	10	11	12
'Shishinden'	1.82	.	.	.	4.5	1.3	1.2	7.6	2.2	0.6	1.3	1.2	1.0
'Raspberry Rimmed'	0.9	.	.	.	2.5	0.8	1.4	4.1	2.3	2.1	2.7	1.4	0.9
T-1 ³	0.6	.	.	.	3.1	1.2	0.9	5.6	2.2	1.7	1.8	0.8	0.8
T-2	0.7	0.8	.	.	2.1	0.5	1.5	4.4	.	2.1	1.2	0.9	0.9
T-3	1.5	0.9	0.2	0.2	5.9	1.8	1.6	7.7	.	3.4	1.9	1.0	1.3

¹ 4=petunidin 3RG5G, 7=malvidin 3RG5G, 18=petunidin 3RGac5G, 20=malvidin 3RGac5G

² Relative area (%)

³ See Table 2.

Table 3. continued

13	14	15	16	17	18	19	20	21	22	23	24	25
0.8	1.1	1.1	3.3	2.3	28.5	.	44.6	.	.	.	1.0	.
1.0	0.8	1.2	2.7	1.8	32.5	3.0	42.3	5.0	0.8	.	1.0	.
0.7	0.9	1.0	3.2	1.9	33.3	.	43.2	0.4	1.0	0.4	1.2	.
1.0	0.9	1.0	2.4	2.1	27.9	2.0	46.7	2.1	1.0	0.5	0.9	1.5
0.8	1.0	0.9	2.2	1.7	22.9	1.1	41.3	1.8	0.5	0.4	0.8	.



Figure 2. Flowers of the diploid cultivar 'Shishinden', the tetraploid cultivar 'Raspberry Rimmed' and triploids of *Iris ensata*. Top left: 'Shishinden', Top right: 'Raspberry Rimmed', Left center: 'T-1', Right center: 'T-2', bottom: 'T-3'.

CULTURAL REQUIREMENTS OF *ORNITHOGALUM SAUNDERSIAE*

A. Coos Bartels
Aalsmeer, The Netherlands

In preparing bulbs of *Ornithogalum saundersiae* for planting, a dip of Thiabendazole (20 grams/liter) and Captafol (15grams/liter) is recommended. This should be used prior to planting to reduce the chances of fungal infection. In the wild this species grows mainly in sandy soils. Any soil type, however, is suitable for planting this ornithogalum as long as drainage is good. To that end, cultivation on raised beds is advised, as is moderation in watering. Soil should be high in organic matter and mulching is advised. Little nitrogen is given, as a light base dressing of fertilizer well balanced in nitrogen, phosphorus and potassium is, in most cases, sufficient, although additional feeding of phosphorus and potassium can improve bulb quality.

A planting scheme consisting of beds 1 meter wide which contain 8 rows across, about 12cm apart, is used. Planting density varies with bulb size, the #14-#18 size bulbs being spaced about 10cm apart down each row (80 bulbs per m²) and the #18-22 size bulbs spaced 12.5cm apart along the row (64 bulbs per m²). During the growing period (3-6 months in moderate and subtropical climates) no special conditions other than a reasonable amount of sun are required, except in the tropics, where shade should be provided to keep soil temperatures down.

Pests and diseases are few. Since the leaves and probably the bulbs of *O. saundersiae* are highly poisonous, insects and mites are not likely to appear. Concerning nematodes, a granular, preventative chemical is advised. The main disease of ornithogalums is the bacterium *Erwinia (carotovora?)*, which is spread by planting tools and materials and which affects other bulbs through contact with "infected" soil or planting implements, during storage, or by spattering of infected soil during rain or irrigation. Infection by contact with spattered soil gives brown, wettish looking, yellow edged spots on the leaves, which leads to penetration of the disease into/throughout bulbs and, eventually, to rotting. Infected bulbs are easily detected during storage by their slimy, black-brown appearance and by their stinking odor. In the field infected plants show a dull green foliage color followed by a drying of the leaves. Since the roots are rotted, plants can be pulled out easily. Another disease which might occur is storage rot (*Penicillium* sp.). Also, although no clear signs of virus have been detected in this species thus far, it is most likely that some virus will be found. The best protection against disease is in prevention.

Pre-planting and after-uprooting dips, removal and destruction of diseased plants, adapted watering systems and a preventative spraying scheme using copper and benzimidazole are recommended as preventative measures for commercial operations.

To prepare for bulb storage, leave the crop without irrigation after flowering in order to induce dormancy. A month of withholding water should be enough before the bulbs are uprooted, their leaves are cut and the bulbs are left in the field to dry for a couple of days. Afterwards clean the bulbs, removing bulblets and destroying diseased bulbs before dipping, drying and storing. Not much is known about storage temperatures, but temperatures of about 25°C for 4 weeks induce total dormancy in the bulbs. The storage area is maintained at 20-23°C until about 4 weeks before planting, at which time a temperature of 17°C is used to stimulate the bulbs to sprout.



Ornithogalum saundersiae is an excellent garden plant that produces tall stems of flowers which are very long lasting in flower arrangements.

Photo: A. Bartels



Figure 1. North facing slope with bulbs.
Chula Vista, California.



Figure 2. *Bloomeria crocea* flowering
on the slope shown in figure 1.



Figure 3. *Allium praecox*



Figure 4. *Fritillaria biflora*.



Figure 5. *Chlorogalum*
parviflorum



Figure 6. *Dodecatheon*
clevelandii



Figure 7. *Sisyrinchium*
bellum.

Photos: Dylan Hannon

A FIELD OF BULBS

Dylan P. Hannon

Bonsall, California, United States of America

INTRODUCTION

Southern California is overall a richly endowed floristic region and this wealth includes many bulbous plants. San Diego County alone, in the southwest corner of the state and with more species of vascular plants than any other county in the continental United States, boasts the following cormous or bulbous taxa: ten *Calochortus*, two *Chlorogalum*, one *Fritillaria*, one *Hesperocallis*, four *Lilium*, three *Zigadenus*, one *Bloomeria*, four *Brodiaea*, one *Dichelostemma*, eight *Allium*, two *Muilla* (Beauchamp 1986), and an assortment of other, mostly dicotyledonous, tuberous herbs. Some areas of the county, particularly within the seventeen or so kilometers between the city of San Diego and the border with Mexico, harbor special, local concentrations of geophytic plants. One site displayed especially abundant bulb life this spring (1995) after a grassland fire passed through prior to the beginning of a second record-breaking rainy season.

Sadly, it is impossible to discuss the natural history of any coastal area of Southern California without giving thought to humankind's extensive and permanent impacts to the landscape. Such activity has been rapacious within the last twenty years and has been dubbed "LosAngelization" by some. Stopped by rugged topography north of Santa Monica, the dense urban sprawl that swirls around Los Angeles is abruptly held at bay to the south at the San Diego County border, where Camp Pendleton, a U.S. Marine Corps training base, preserves some 20,000 hectares in a natural, relatively undisturbed state. Immediately to the south of the base, coastal cities of varying sizes extend all the way to the international border. Between this valuable ocean front real estate and the main mountain features of the county (the Palomar and Cuyamaca ranges, Otay Mountain, etc.) lies a broken series of mesas and low rolling hills of roughly 15 to 30km in width. Much of this more inland area has also been dramatically altered by human activities, most notably historical agriculture and more recently by suburban growth around formerly small towns. While the mountains harbor a more or less discrete set of bulbous plants (especially *Allium* and *Calochortus*), these mesas and hills are home to much denser and richer associations of cormous, bulbous and variously tuberous geophytes.

The natural vegetation of the coastal hills of San Diego County

is primarily sage scrub wherever slope aspect is to the south or west, with low suffrutescent (soft-wooded) shrubs such as California Sagebrush (*Artemisia californica*), Flat-top Buckwheat (*Eriogonum fasciculatum*), Coastal Brittlebrush (*Encelia californica*) and Black Sage (*Salvia mellifera*) making up a large percentage of the shrub cover in many areas. This habitat is where many more of the bulbs are to be found, particularly where clay soils occur. On many north-facing slopes near the coast, a "dense phase" of sage scrub occurs. Shrubs occurring here include an often dominant presence of Lemonadeberry (*Rhus integrifolia*), as well as Mexican Elderberry (*Sambucus mexicana*), Fuchsia-flowered Gooseberry (*Ribes speciosum*) and the ubiquitous California Sagebrush (*Artemisia californica*). Trees are almost entirely absent from this region, except for small stands of willows (*Salix lasiolepis* and *S. gooddingii*) in the larger seasonal streams and rivers. Chaparral, comprised of often impenetrable stands of much larger woody shrubs up to three or four meters in height, may be found on east and especially north-facing slopes. In the southwest coastal part of the county, chaparral is not generally found until one moves into mountainous terrain some 15km inland. Grasslands are to be seen everywhere in this area, but the plants are almost all introduced annual grasses (*Bromus* spp., *Avena barbata*, etc.) and mustards (*Brassica*, *Raphanus*) from Europe, and this habitat most often represents past agriculture and/or grazing activity. Native perennial grasslands do occur in patches here and there, mostly on north-facing slopes and often in association with various bulbs. It is likely that these stands of native grasses (mainly bunchgrasses, *Nasella pulchra* and others, formerly in the genus *Stipa*) have existed primarily as components of a mosaic of shrublands and smaller concentrations of herbaceous cover rather than large, grassy expanses.

THE BULBS

Chula Vista is the largest United States city south of San Diego and it has grown markedly in the last two decades, primarily in the form of single family housing tracts. Due east of the city, and literally within a stone's throw of one such development project, lies a small coastal valley with a north-facing, grassy slope of scattered Lemonadeberry and a markedly rich and diverse local bulb flora (Figure 1). This site lies some 4km east of a protected bay on the Pacific ocean and about 6km from the open ocean. Well represented here in the thousands are Golden Stars (*Bloomeria crocea*), Early Onion (*Allium praecox*) and Blue Dicks (*Dichelostemma capitatum*, formerly *D. pulchellum*). The *Bloomerias*

(Figure 2) are the last to flower, starting in mid-April in 1995, while concurrently one may find Blue Dicks both with open, dry seed capsules and fresh, bluish lilac flowers. By this time Early Onion (Figure 3), living up to both its vernacular and scientific names, is long past its March blooming period, and umbels with drying seed capsules yield their jet black seeds. Not a common plant, this pretty onion relative often lights up local meadows with a soft, white glow tinged the palest pink, on north facing slopes where it grows. This species apparently is restricted to clay soil formations.

Chocolate Bells (*Fritillaria biflora*) sends up its flowers earliest of all the geophytes at this locality, and has been recorded as blooming even in January. It is widespread in the state in the coastal ranges and is rather variable as to flower color. The number of flowers per peduncle may often exceed the paired condition suggested by the specific epithet. This very lovely plant is the only fritillary to occur at low elevations in southern California.

Fritillaria takes its name from the Latin *fritillus*, or dice-box, and the seed pods of Chocolate Bells are no exception in living up to this general resemblance (Figure 4). This species is what initially sent the author scouting along these slopes, and it was heartening to see them in some abundance here. Most of the plants occurred in groups of about twenty to fifty individuals and at least a dozen such colonies were observed within the general population. Very few plants were found as isolated, scattered individuals. Young plants, perhaps a year or two away from flowering, were not infrequently seen, indicating that reproduction is occurring successfully in spite of damage by rabbits to up to twenty percent or so of fruiting stems, though many such fallen "dice-boxes" were undamaged themselves. Historically never a common plant, this population is one of the few that remains along the coast in Southern California.

Of the ten or so species of *Calochortus* (mariposa lilies) recorded for San Diego County, only two, *C. weedii*, a robust plant with bright yellow flowers, and *C. splendens*, with light pink-lilac goblets on tall stalks, occur near sea-level. The former prefers rocky areas away from the immediate coast, while *C. splendens*, the "Splendid Mariposa", is common at this site and elsewhere as scattered individuals, usually nearer the ocean; one was noted here with pure light pink flowers, without any trace of lilac evident. Peak flowering season for this plant this year was roughly late April, though some were seen at the same time with very young flower buds.

One of the several species of soap plant in California,

Chlorogalum parviflorum, was noted at this site. It is so called because the bulb can be used effectively as a bar of soap after some maceration. The Spanish name for the plant is *amole*. The scabrous, very attractively undulate leaves of this species (Figure 5) are similar to those of the more well known and more northerly *C. pomeridianum*, which has a weak presence in the county. The latter is an altogether larger plant, with flowering stems up to two meters or more in height bearing crepuscular flowers, while *C. parviflorum* scarcely reaches one meter and has diurnal flowers. In both species flowering is in late spring or summer as the leaves begin to wither, the small whitish flowers with each narrow segment bearing a darker midvein. This relatively dwarf soap plant may be encountered in many areas of the county west of the mountains and on hot, exposed south-facing slopes on rocky soil as well as shadier sites on clay soils. Competing herbaceous vegetation is often conspicuously reduced because of such substrate preferences.

A further geophyte at this locality which is neither bulbous nor cormous is Shooting-stars (*Dodecatheon clevelandii*), with a short rootstock that is subtended by somewhat fleshy roots. This plant pushes up soon after the first rains and produces a small rosette of pale green, spatulate leaves which have faintly crisped-dentate margins. The flower scapes begin appearing about January and February and by March begin bearing their umbels of flowers, an inflorescence type unusual amongst herbaceous dicots outside the parsely Family (Apiaceae or Umbelliferae) and geranium family (Geraniaceae). The individual flower stalks are erect-ascending and the flowers nod downward, with the pinkish to light purplish-pink petals reflexed sharply upward, giving a sort of cone-like shape to the corolla. The tip of this "cone" is strikingly colored jet black and immediately above is a narrow band of orange-yellow, both contrasting beautifully with the soft pastel-hued petals. One of the most elegant small perennials native to Southern California, Shooting-stars is scarcely to be met with in cultivation. Years ago the author saw a 20cm clay pan filled to the brim with the leafy shoots of this plant and with several flower scapes, so it should not be impossible to succeed with it if its seasonal requirements and need for a little shade are met (see cultivation information below). By April, the umbels of Shooting-stars are already displaying ripe seed capsules, the angular, pale brown seeds giving off a peculiar though pleasant scent.

Blue-eyed grass (*Sisyrinchium bellum*), though not a geophyte, is an attractive member of the iris family which is common and wide-spread throughout the western portion of the state. It is also

fairly well-known in horticulture in amenable climates. This plant prefers more open, grassy areas, frequently in clay soils and mostly on north facing slopes in semi-arid San Diego County. The roots are somewhat wiry; the tufted, narrow, straight leaves are glaucescent and give rise to flowering shoots bearing numerous flowers appearing over several months in spring. The individual flowers are ephemeral and at this site were somewhat variable in size and color, those in Figure 7 being a particularly rich royal purple. South of this valley, one plant was found which had white flowers with a small purple eye, and other similar forms are met with in cultivation.

Searched for in the area but not found was one of the *zygadenes*, or Death Camas (*Zigadenus fremontii* var. *minor*), a dwarf coastal taxon which ranges into northern California. Similar north-facing slopes with clay soil only 2km to the south harbor populations of this plant, and its presence at this locality may have been overlooked. With short spikes of greenish flowers about two centimeters across and long, arching, bright green, narrow leaves, it is more a plant for ardent collectors than for general bulb enthusiasts.

IMPORTANCE OF OCCASIONAL BURNING

Fire was probably the most important factor which turned this small area into an extravagant field of flowering bulbs this year, and the multiple effects of wildfires on plants are rather well known today. Since the flowering shoot is often already pre-formed in the axil of a given leaf of a dormant bulb, and similar initiates or potential initiates are apparently lying in wait in corms, the major effects of fire must be to help the geophyte make the best of what it has already built up in the previous season(s). Gasses which are the direct result of incineration of brush or leaf litter are now known to be the agents primarily responsible for giving the dormant bulb or tuber the stimulation needed to quickly produce more flowering stems and/or flowers than normal after the first rains of the season, and to trigger flowering in a greater percentage of the bulbs in a given population. The additional effects of clearing surrounding thatch and competing vegetation, especially rank, non-native annuals, giving bulbs more light and a head start on many other plants, as well as nutrients from the ash and perhaps the benefit of higher soil temperatures when the moist, bare soil is warmed by the sun after the first rains, all contribute to the often spectacular showing of bulbs and annuals after a wildfire. The need for chaparral to regenerate through burning every so many decades has been well documented in

California, and long-term fire suppression can lead to disastrous results for homeowners residing in such areas. The risk of fire is exponentially greater when the vegetation has not burned for thirty or forty years or more, leading to dangerously high fuel loads comprised of dead wood and many senescent woody plants. Differences in otherwise similar vegetation in adjacent Baja California, where fire suppression is almost nil, are often striking. One of the greatest of these differences is the richness of native, annual, spring flowers in northern Baja California, whose counterparts in Alta California have been displaced by non-native annual grasses, especially bromes (*Bromus diandrus*, *B. madritensis* ssp. *rubens*, etc.) in many areas.

It would be interesting to know what effects fire has on the long-term population dynamics of various bulbs in Mediterranean climates, even though fires are not so spectacular, and hence not so likely to be studied, in the shrublands as in chaparral. It is worth reiterating that abundant rainfall two years in a row also played an important role and combined in rare form with fire to make conditions this spring ideal for maximum bloom and beauty.

THE FUTURE?

What will become of this botanical wonderland remains to be seen. The small valley of which this slope forms one side, the bulbs occurring in the suitable habitat that extends for about two kilometers eastward, is slated for a housing development in the very near future, much as the surrounding area has gone before it. Until Southern California learns to grow up rather than out, those of its citizens who love nature and natural areas will continue to bear witness to ever more destruction of what vestiges remain.

CULTIVATION

Though the plants discussed above grow in heavy clay soil in habitat, attempts at cultivating them under simulated soil conditions are likely to meet with mixed results at best. In the garden any soil that is not too porous (coarse, fast draining sandy soils for instance) or too rich in organic matter should suit them generally. While their natural soil substrate is not recommended for garden or, especially, container culture, it is very important that these geophytes be allowed their natural seasonal cycle of a cool, moist growing season in late fall, winter and early spring, and a dry and fairly warm dormancy from late spring to early fall. Outside Mediterranean climates, the bulbs or corms will need to be dug or let set dry in their pots so that they are not subject to moist, warm conditions over summer. Storing the bulbs in paper-

bags works well as this allows some air exchange so bulbs can "breathe" while dormant. In parts of California, native clay soils may dry in summer to the extent that they leave conspicuous fissures extending at least to the depth of any resident bulbs therein, and some of the latter are thus exposed to the air, though they remain well protected from the heat of the sun. Growers living in summer rainfall areas can store any Mediterranean climate bulbs in the summer more safely by keeping humidity low, in the range of twenty to forty percent.

Low/high temperatures in coastal southern California are, in degrees Fahrenheit, generally in the 40s/60s in the middle of winter and gradually warm to the low 60s/70s-80s by the height of summer. Significant, damaging frost, with temperatures at 32°F or below for more than a few hours and on more than a handful of nights in one season, are not regularly expected except in some low lying areas where cold air masses can accumulate. The bulbs of the region, however, being representatives of essentially temperate genera, are mostly well equipped to cope with brief freezing or sub-freezing spells and foliage and flowers should suffer only minimum damage, if any. Of importance is whether the plants have built-up to the cold, that is, have had successively cooler nights prior to the frost and have invested their aerial parts with chemical cold protection.

Natural lighting conditions on this Chula Vista hillside are open and well lit in spite of the north facing slope aspect. In mid-winter, full sun is rather scarce, but by March-April many of the plants enjoy at least a few hours of full sun per day. From the top of the slope downward, the sun does not "roast" the soil at any time of year, as would happen on south facing slopes. Hence, semi-shade perhaps best describes the light needs of these bulbs. Most important is to avoid extremes: neither deep shade nor full blazing sun suit these plants, unless one is compensating for a corresponding lack of sun and heat (as on the immediate coast) or excess of same further inland. A few other coastal native geophytes, however, do grow under these extremes, e.g., *Allium haematochiton* (sun) and *Jepsonia parryi* (shade), the latter a diminutive saxifrage with a small, sphaeroidal tuber and single, palmately veined leaf and hysteroanthous flowers in late autumn.

Although seasonal rains of any and all duration and intensity are usually thoroughly enjoyed by these and so many other plants in the garden and in pots, similar quantities of inferior water issuing from the hose line can bring disastrous results. It is generally safe to let the soil in which Mediterranean climate bulbs are planted dry out in the top 2cm or so between waterings, espe-

cially considering that they are cool season growers. All waterings should be very thorough, as with most other plants. These bulbs and many others can be successfully grown in smaller pots more easily than is commonly suggested, though such a practice will likely necessitate more frequent watering. A smaller container means that more of the roots are situated around the inside of the container, thus receiving a combination of increased warmth and aeration. Too large a container results in roots sitting in a mass of cold, wet soil for longer than necessary. For the bulbs discussed here, which do not grow much over 60cm tall, a 15-20cm or one gallon pot should serve well for a planting of several bulbs.

Potting mixes for these fine rooted bulbs can be fairly sandy and may incorporate up to 20% actual soil, dug out of the garden, which should provide adequate quantities of silt and clay, beneficial in such low amounts for keeping roots from excessive moisture and temperature fluctuations. The living organisms contained in the soil are also largely beneficial, and if the soil is healthy in the first place and conditions in the containers are kept from any extremes, especially those of excessive moisture, commonly feared scenarios regarding garden soil in pots should not materialize. Organic matter should be kept at a minimum, no more than 20% or so. A final ingredient, one to use liberally to increase drainage capacity and which ranks with bread and water for the author, is pumice. It is not easy to obtain, unfortunately, even in southern California, where it is mined primarily for the manufacture of cinderblock. Different grades may be selected depending on the diameter of the roots of the plants in question; fine grades, with particles 1-3mm in diameter, work well for many fine rooted bulbs, while larger rooted plants such as many of the amaryllids benefit from the ample use of grades with particles 4-8mm in diameter. Pumice is durable and gives sharp drainage; it is lightweight relative to sand and soil and so gives "body" to the mix. Perlite is no substitute for pumice in many cases, since the structure of the former is not durable and studies have shown that it can accumulate salts and give off fluorides. Perlite also may pose a health risk when dry, as the dust invariably associated with it, if inhaled, can cause respiratory problems if protective measures such as pre-wetting and wearing a filtering face mask are not implemented. All potting mixes of course must bend to locally available ingredients and to local climatic conditions, and to the experience of the grower. It is hoped that this outline of suggestions will lead to productive trial and error.

Growing these plants from seed is especially rewarding and often gives a better chance of ending up with more plants that are

better adapted to one's climate than by simply buying the bulbs. Ideally, seeds should be planted in late fall, October or so in the northern hemisphere, but the author has had good luck with sowings made as late as February-March. In either case, the first year's corm or bulb is usually very small and earlier sowing does not always make a great difference in this regard. Fertilizing, on the other hand, can make all the difference needed to produce bulbs large enough to ride out their first dry dormancy comfortably. Very dilute feedings of any fertilizer low in phosphorus, higher in potassium and moderate in nitrogen are suitable, though equal N-P-K ratio formulations also can serve well. No fertilizer should be applied until germination has occurred, and even then a week or two may pass since there is a small food store within the seeds of most plants. The salts which make up basic fertilizers can inhibit germination in a wide range of species. It is a good idea to divide up a seed batch of a given species into several sowings over a period of several months, as long as satisfactory, cooler temperatures can be maintained for germination and at least one month afterward. As to exact sowing methods, as a general rule it is best to bury the seed with as much fine potting mix as will cover them to a depth as great as the diameter of the seed, and to keep the pots or trays moist and shaded thereafter. Where algal buildup may be a problem, seed pots can be covered with a thin layer of chicken grit or similar fine gravel product. This procedure also moderates moisture loss somewhat, though a disadvantage is that the surface of the mix cannot be watched so easily for drying. Potting mix for seeds should be sieved to remove any particles larger than the seed itself in the case of these California natives; the mix may otherwise be the same as for adult plants, though it is probably safer to substitute very fine sand for garden soil so as to secure more or less sterile conditions. No special treatments or procedures should be needed provided one has fresh seed. When harvested in spring, seeds should not be refrigerated over summer, but kept more or less at room temperature until autumn, simulating conditions in habitat. Once seedlings go dormant after a first season of growth, the seed pots should be kept dry and shaded over summer. Despite the sometimes very small size of such bulbs, hardly a millimeter in diameter in some cases (especially if underfed), they are well equipped to pass the season in a completely dry state.

REFERENCE

Beauchamp, R. Mitchel. 1986. A FLORA OF SAN DIEGO COUNTY, CALIFORNIA. Sweetwater River Press, National City CA.

THE CORRECT IDENTITY OF *HYMENOCALLIS GALVESTONENSIS* (HERB.) AMARYLLIDACEAE

T.M. Howard

San Antonio, Texas, United States of America

Hymenocallis galvestonensis (Herb.) T.M. Howard, is a rare plant found in the eastern half of Texas and the east Texas gulf coast from Galveston Bay (hence the name) to southeast Oklahoma, western Louisiana, southern Georgia and northwest Florida, flowering from brown-coated ovoid bulbs in late summer after ripening of suberect, lanceolate-elliptic, subacute, glaucous foliage.

Hymenocallis liriosme (Raf.) Shinnery is a common denizen of ponds, ditches and estuaries of the eastern half of Texas, Louisiana, and Mobile Bay, flowering in spring from black-coated, obovoid bulbs, contemporary with the erect, linear-acute, shiny green leaves.

Salisbury (1812) established the genus *Hymenocallis* in order to segregate the Old World *Pancratium* L. from several allied New World genera differing in their seeds, filaments and foliage. Rafinesque (1817) described *Pancratium liriosme* as a new species from Louisiana. Herbert (1837) recognized *Hymenocallis* as a valid genus and established the related genera *Choretis* Herb., of Texas and Mexico, and the South American Andean *Ismene* Herb. and *Elisena* Herb.

Choretis was defined as intermediate between *Hymenocallis* and *Ismene* because its seeds are paler, shorter and rounder, rather than dark green, elongated and angled; the scapes are rounded in cross section rather than compressed-ancipitous; and because of slight differences in the anther's curvature and position in relation to the filaments. The perianth of *Choretis* is very similar to that of *Hymenocallis*. Two species were placed in the genus *Choretis*: *C. galvestonensis* Herb., from Texas and *C. glauca* Herb., from Mexico. The differences between the two groups blurred as more *Hymenocallis* species were discovered in the southeastern United States and southwestern Mexico, sharing mixed vegetative characters of the two in the seeds, bulbs, leaves and flowers.

Baker (1888) reduced *Choretis* and *Ismene* to synonyms of an enlarged genus *Hymenocallis*, while retaining the genus *Elisena* as distinct. Since then, the genus *Hymenocallis* has been revised, refined and enlarged by various workers, including Roemer (1847), Knuth (1850), Velarde (1949), Sealy (1954), Shinnery (1951), Traub (1962), Howard (1978, 1979, 1981, 1982, 1990), Flory

(1976, 1978), Ravenna (1979, 1980), Bauml (1979) and Laferrie (1990). Traub (1962) reduced *Ismene* to a subgenus of *Hymenocallis*. Meerow (1990) restored the genus *Ismene*, while combining it with *Elisena*. *Ismene* and *Hymenocallis* are once again retained as separate genera and *Elisena* is now a synonym for *Ismene*.

1. *Hymenocallis galvestonensis* (Herb.) Bak.

Syn. *Choretis galvestonensis* Herb. AMARYLL. 22L-222, t. 41, figures 34 & 36 (1837) Type: Drummond III. n. 412. Texas, Galveston Bay.

H. eulae Shinnars. FIELD AND LABORATORY, Vol. XIX, No. 2. pp. 102-103, 1951.

H. molderkiana Traub, PLANT LIFE 1962, Vol. 18, p. 71, 1962.

Choretis galvestonensis was based on a specimen consisting of a leafless scape (Drummond 412) and observation of living material in the Drummond collection. The type specimen was collected in flower by Drummond near Galveston Bay, Texas, and deposited in the Hooker Herbarium, now at Kew. A second Drummond collection, #370, identical to Drummond 412, likewise consists of a naked scape. It also was housed in the Hooker Herbarium.

Herbert retained a live bulb that Drummond had sent with his collection of number 412 (no bulbs were sent of 370) and was able to make important observations of the bulb coats and the scape's basal "stump" remaining in the bulb neck. The following year he was able to observe the glaucous foliage and growing habits of this same bulb, noting that it leafed out with eight sub-erect, glaucous leaves in the spring, becoming dormant by mid summer.

At the time of the publication of Herbert's AMARYLLIDACEAE (1837) there is no record of the Drummond bulb having flowering in cultivation. The author's experiences have shown that *Hymenocallis galvestonensis* is a difficult plant to maintain for more than a season in cultivation unless its special requirements are met. Bulbs require a well-drained acid sandy loam as it will not tolerate alkalinity or a damp situation. It is possible that Herbert lost the Drummond bulb before it ever flowered.

Drummond's 412 is accompanied with Herbert's notation "genus like *Crinum*, supposed by me to be this plant. Flowers four, scape 9-11 inches, spathe 2 inches long, valves disjointed, germen sessile, tube scarcely 2 1/2 inches long, limb 2 1/2-3 inches, style scarcely exceeding it, filaments an inch shorter". (The collection is comprised entirely of one inflorescence; no vegetative features are mentioned in the accompanying field notes.) "There are no leaves to the specimen. On first sight of Drummond's leaf-

less bulb labeled "genus like *Crinum*" without leaf, I pronounced it to be an *Ismene* if of any known genus, and probably allied to the plant since named *Choretis glauca*, but the integuments are much paler and not black as in that bulb. Last spring it produced eight, suberect, glaucous leaves, not vaginating. Having been forced into growth early, it has gone to rest before the end of July. *Choretis glauca* also has gone into an early summer sleep under similar conditions of early forced growth. I entertained little or no doubt that it is the same plant which I have named *Choretis galvestonensis* from the specimen in Sir W. Hooker's herbarium, which is not accompanied by a leaf. It certainly has no immediate affinity to *Crinum*. I am not sure whether there is a third species amongst Drummond's bulbs or only a duplicate with a different label. The bulbs are sulky and do not sprout readily before they are well established. The stamen in Drummond's specimen is exactly similar to that of *glauca*."

In his discussion of *Choretis*, Herbert (1836) noted that the "filament attached to the upper part of the anther is a prominent callosity; seeds short, oblong, i.e. intermediate in form between those of *Hymenocallis* and *Ismene*, shorter than the former, but not round, as in the latter. Perianth of *Hymenocallis*, habit of *Ismene*. Scape round (Q. whether always?) which is two-edged in *Hymenocallis*. Natives of Mexico and Texas."

Herbert apparently possessed bulbs of *H. lirisome* (Raf.) Shinnars, also from Drummond, but he was unsure of their identity as he mentions "(possibly) a third species amongst Drummond's bulbs, or only a duplicate with a different label. The bulbs are sulky and do not sprout readily before they are well established." The word "sulky" is the clue, since *H. lirisome* is a bog plant and has a reputation of sulking if not given wet conditions in cultivation. Herbert grew *C. galvestonensis* in sand (see his discussion of *C. glauca*) and succeeded with its culture. *H. lirisome* would fail under similar conditions unless grown as an aquatic.

2. *Hymenocallis lirisome* (Raf.) Shinnars. FIELD AND LABORATORY, Vol. XIX, No. 2, pp 102-103, 1951.

Syn. *Pancratium lirisome* Rafinesque. FL. LUDOV. 19, 1817.
Habitat ponds.

Hymenocallis galvestonensis sensu Baker, non Herbert.

HANDBOOK OF AMARYLLIDACEAE, p. 126, 1888. E. Hall 630. 1872. Houston. (BM, K); dedit Lindley anno 1843. Louisiana, New Orleans, T. Drummond 370 (BM).

Baker failed to recognize that the Drummond 412 and 370 specimens represented a species different from Hall's 630, and assumed these all to be a single taxon because of the striking similarities of the dried scapes. Baker worked only with dried material. The Hall 630 specimen consisted of a dried scape with several flowers and buds and a single, dark green, strap-shaped leaf. Most North American *Hymenocallis* have somewhat similar flowers but more markedly different foliage and habits. In the case of the two Texas species, *H. galvestonensis* and *H. liriosme*, aside from the peduncle cross-section, the flowering parts are nearly identical, save for differences in fragrance and in the flowering season. The differences in foliage and habitat are more obvious, but these would have to be observed before the flowers in the case of *H. galvestonensis* in order to determine which is which.

Baker ignored the unique foliar characters of *C. galvestonensis* cited by Herbert in favor of the different (and seemingly more complete) foliage of the Hall collection: Drummond plants (as described by Herbert) and those observed in the Hall collection. He thereby unwittingly described a new species different from the Drummond species, as *H. galvestonensis* (Herb.) Baker. This created confusion since the resulting description was based upon a specimen (Hall 360) of a different taxon, and is rejected on these grounds. Article 48.1, I.C.B.N. 1988. Baker acknowledged the Drummond specimens, but excluded them (on the basis of the leaves) in his revised description of *H. galvestonensis* (Herb.) Baker. By ignoring Herbert's discussion of the unique foliar and growing habits of *C. galvestonensis* and substituting the Hall specimen in its place, Baker nullified the Drummond type specimen of Herbert's *C. galvestonensis* in favor of a plant that he erroneously described under *H. galvestonensis* (Herb.) Baker. Unfortunately the plant thus described by Baker was previously validated as *Pancratium liriosme* Raf. in 1817, a mere 71 years earlier! Thus *H. galvestonensis* sensu Baker would eventually become a synonym for *H. liriosme* (Raf.) Shinnars. It would be another 132 years before this would be partially corrected by Lloyd Shinnars in 1951. Sealy (1954) noted that the Hall specimen was a denizen of ponds, bottom land and wet places in Louisiana and had flowers contemporary with the leaves in early spring. I have since had the opportunity to compare slides of the Drummond and Hall specimens photographed at Kew by Dr. Dave Lehmiller, and I find, based on foliar differences, that they represent two different Texas species. One of these is *H. liriosme*, represented by Hall 630; the other is *H. galvestonensis*, represented by the Drummond collections 412 and 370.

Hymenocallis liriosme (Raf.) Shinnars is the same as Hall's

#630, with erect, linear-acute foliage, contemporary with the scape in spring. It is also the same plant Baker mistakenly described when he transferred *Choretis galvestonensis* to *Hymenocallis* as, ignoring Herbert's original notations in the process. This plant does not agree with *H. galvestonensis* sensu Herbert, and is the result of an unfortunate case of taxonomic confusion. The correct determination of *H. galvestonensis* directly affects the correct identity and nomenclature of several other North American *Hymenocallis* species and synonyms: *H. occidentalis*, *H. caroliniana*, *H. liriosme*, *H. eulae* and *H. moldenkiana*.

In describing *H. galvestonensis*, Baker probably probably selected the Hall specimen over the Drummond specimens on the basis of its having the foliage contemporary with the flowers while the Drummond specimens seemed incomplete, consisting only of leafless scapes. Nevertheless, the floral features of the leafless Drummond specimens were incorporated into Baker's description [*H. galvestonensis* (Herb.) Baker] to include also the florally similar Hall 360. Thus he revised the description of the leaves to reflect this, describing foliage quite different from what Herbert had described. One need only compare the leaf figured in Herbert's Figure 36, Plate 41, with the leaf of the Hall #630 specimen. Foliage of the Hall plant is relatively narrow, with leaves no more than an inch broad. The leaves appear to be erect, dark green, and the apex appears to be acute, although it is difficult to determine this from the slides. Herbert reported the leaves as suberect and figured them as more obtuse than the leaf of the Hall specimen.

Baker inadvertantly redescribed *Pancratium liriosme* Raf. (1817). (It should be noted that the Hall specimen lacks the all-important bulb with its blackish bulb coats as typified by *H. liriosme*. These would contrast sharply to the Drummond #412 bulb, which had light brown coats.)

Hymenocallis galvestonensis Baker, non Herb. (1888), based on the Hall 630 specimen, is a homonym, for earlier (*Choretis*) *H. galvestonensis* of Herbert and must, therefore, be rejected. The basionym for *H. galvestonensis* (Herb.), *C. galvestonensis* is based on Drummond 412 & 370, while Hall 630 represents *H. liriosme*.

Shinners (1951), dealt with the two *Hymenocallis* from Texas in FIELD AND LABORATORY. The first of these, *H. liriosme* (Raf.) Shinners, flowers in spring, contemporary with its foliage. It is a common, widespread plant found in wet places from the Neuces River basin in South Texas, east to Mobile Bay, Alabama, and is also found in NE Texas, SE Oklahoma and Arkansas.

The second species, *H. eulae* Shinners, is a synonym of *H. galvestonensis* Herb., a rare plant found in northeast-central

Texas and the east Texas Gulf coast, starting at Galveston Bay (hence the name), southeast Oklahoma, eastward to southern Georgia and northwest Florida, flowering in late summer after ripening of the foliage. Some material identified as *H. occidentalis* (LeCont) Knuth or *H. caroliniana* (L.) Herb may be *H. galvestonensis* Herbert.

Shinners segregated his *H. eulae* from *H. liriosme* on the basis of the length of the tepal tubes, an unreliable character. Lengths of tubes, tepals and foliage vary from year to year depending on culture, humidity, temperature, precipitation and infraspecific genetic variation. More dependable characteristics include whether the plants flower primarily in spring, with flattened ancipitous scapes, foliage that is erect, linear-acute, shiny green, contemporary with flowers, and seeds large, dark green, much longer than wide; or whether the plants flower primarily in late summer or autumn, with scapes that are rounded, or oval and somewhat flattened, with leaves that are suberect, glaucous, sub-acute, produced (in spring) before the flowers, and with seeds pale green and roundish.

Rafinesque published *Pancratium liriosme* in FL. LUDOV. 19, 1817, noting that it was "a beautiful plant, growing in moist grounds and round small lakes; its bulb is about an inch in diameter, black outside and white within; radical leaves deep green, shining, similar to those of *Narcissus*; stem compressed, nearly winged, two feet high, umbel of about six white large flowers (8 inches in diameter) each with a spathe, and having a fragrant smell, nearly similar to that of a common lily; the anthers are long and yellow; it blossoms in March. It has an affinity with *P. rotatum* of Ker and Pursh". Following the lead of Salisbury, Shinners transferred this plant from *Pancratium* to *Hymenocallis* as *H. liriosme* (Raf.) Shinners.

The second species was published as a new discovery, *H. eulae* Shinners. The type bulbs were collected in northeast Texas and cultivated by Dr. Eula Whitehouse, technical assistant of the Herbarium at Southern Methodist University and artist-author of TEXAS WILD FLOWERS IN NATURAL COLORS.

Shinners was aware of the deciduous habits of this bulb, noting that "the foliage appears in the spring, dying before the flower stalk appears," yet failed to describe the leaves or the bulbs and bulb coats. Flowering collection dates were given for August and September. Although the plants were similar, Shinners excluded *Choretis galvestonensis* Herb. from consideration in his description of *H. eulae* because the scapes observed on Shinners' type specimens were oval and compressed, "not round in cross section" as reported by Herbert. Shinners observed "the presence or

absence of a round, or compressed scape can hardly be satisfactorily determined from a dry specimen", excusing his rigid interpretation by suggesting that "Herbert may well have been mistaken".

This brings up an interesting, important point. Since Herbert described his plant from a dried specimen (Drummond #412, #370) how could he possibly know that the scape was rounded? At this time Herbert had not seen the living flower or scape! The answer is that Drummond sent a live bulb to Herbert, along with the dried scape. As with daffodils, this *Hymenocallis*, having already flowered and in a dormant condition, was left with a scape vestige from the previous flowering in the form of a short basal stump-scar in the neck of the dry bulb. One can easily demonstrate scape vestiges at this stage. This can also be demonstrated in certain other *Hymenocallis*, as found in some of the Mexicana group. It is a simple way to determine if the bulb has flowered the previous season and the cross-section outline is easily determined. I have confirmed this condition in bulbs from several dormant species of *Hymenocallis* of the Mexicana alliance, so Herbert's observation was correct and direct: that the scape was not ancipitous as in other *Hymenocallis*.

Traub (1962) placed both Texas species in his *H. caroliniana* alliance noting that the anthers were introrse and erect, rather than extrorse and versatile. Superficially this seemed contrary to Herbert's observation for *Choretis*. In both Texas *Hymenocallis*, the anthers are long, straight and vertical immediately after evening anthesis, and the insertion is eccentric; the following day they shrink from the heat, becoming curved at both ends. They are then twisted and "versatile" as Herbert noted. I have observed this often in living material, even in different flowers on the same scape. It is unfortunate that so much emphasis was placed on this confusing, ambiguous character. Traub maintained confusion with these Texas bulbs by rejecting *H. liriosme* (Raf.) Shinnars, in the belief that it was a synonym for *H. galvestonensis* Baker, non Herb. The Shinnars specimens at Southern Methodist University now have the name *H. liriosme* (Raf.) Shinnars scratched out and replaced with the notation *H. galvestonensis* (Herb.) Baker, "determined by Traub" (!). Interestingly, although Shinnars recognized that *H. liriosme* was *H. galvestonensis* Baker, non Herb., he understood that it was not the same as Herbert's *Choretis galvestonensis* and stated this in his transfer of Rafinesque's *Pancratium liriosme*. Shinnars correctly established *H. liriosme* (Raf.) Shinnars as a new combination for *P. liriosme* Raf., but he erred in his interpretation (and publication) of *H. eulae* Shinnars as a new species.

The name "Galveston" suggests a plant that might be restrict-

ed to Galveston Bay. Although a rare plant, *H. galvestonensis* is widely distributed in sandy, well drained woodland ecologies, from east Texas to Georgia. It is always easily recognized by the suberect, oblanceolate, bluntly acute, glaucous foliage. The fountain of leaves appears with a rush in the spring and then dies back in midsummer. Scapes emerge, sometimes overnight, after good rains, any time between July and October. The flowers are dramatic, spectacular, and distinctly scented with a very sweet, spicy odor, smelling very much like those of *Pancratium maritimum*, *H. azteciana* and *H. leavenworthii*. Both *H. galvestonensis* Herb. and *H. liriosme* hybridize easily with other *Hymenocallis* species, including various Mexican species and the genus *Ismene*. Seeds for *H. galvestonensis* Herb. are a pale greenish-white, about the size and form of a small olive with the fruiting scapes leaning toward the ground. Those of *H. liriosme* are dark green, larger and longer. Bulb coats for *H. galvestonensis* are a pale brown, compared to those of *H. liriosme*, which are blackish. Where the two species are found growing near one another, *H. liriosme* is found in mucky, low, wet spots, river bottom land, and in ponds and ditches wherever water stands, whereas *H. galvestonensis* Herb. is always found on higher ground where drainage is excellent. Both can take considerable shade.

The scapes of *H. liriosme* are compressed and ancipitous (two-edged). Those of *H. galvestonensis* are more variable and may be round, or oval with rounded edges or somewhat compressed, depending on individuals and different populations. This is not a reliably constant character. For that matter, a number of Mexican *Hymenocallis* species share this same rounded scape character and too much emphasis was placed on it by Herbert and subsequent workers. Based on what we know today there is no justification for the genus *Choretis*, and it is appropriate that Baker merged it with *Hymenocallis*.

Material known as *H. moldenkiana* Traub was collected by Mrs. Mary G. Henry, (no date given), and by this writer in south central Georgia, (in leaf), in the spring of 1954. I was able to grow these side-by-side with bulbs of *H. galvestonensis* from Newton County in east Texas, and from Merryville, Louisiana, and I found them virtually identical, save that the Georgia form was slightly larger. They have similar foliage, habits, and the same, strange fragrance. In the spring they simultaneously produced the same fountain of blunt-tipped, glaucous foliage. They then dropped their foliage together in mid-summer and flowered together on naked scapes in late summer. Fruiting habits and seeds were identical. It seems that this is a single species as both forms grow in similar environments. Therefore *H. galvestonensis* Herb. is

native to both Texas and Georgia, as well as neighboring states in the eastern half of the South, almost equidistant (eastward and westward) from the Mississippi River delta. *Hymenocallis moldenkiana* Traub is a synonym for the eastern form of *H. galvestonensis* found in Georgia and northwest Florida. Meerow (pers. corr. 1989) reports it as being found along the bluffs of the Appalachicola River in northwest Florida. Traub (1962) described *H. moldenkiana*, noting that it and *H. eulae* both flowered in late summer, but failed to note that *H. moldenkiana* likewise flowered after the leaves or that they had similar foliage. This may be because, given optimum culture and abundant moisture, the foliage may sometimes persist until after flowering, becoming dormant while fruiting. In nature, alternate wet and dry spells make it easier for this species to lose its leaves before anthesis.

Dorman, (1961) PLANT LIFE, published excellent articles accompanied by fine line drawings, discussing three species found in Louisiana. Readers can study two of these: *H. galvestonensis* Herb. (as *H. eulae*) and *H. lirisme* (as *H. Galvestonensis* Baker, non Herb.) and compare the details of their bulb and foliar differences. The artistry is excellent. She notes that a third species, *H. caroliniana* (L.) Herb. (?), found in northeast Louisiana, is taller, spring flowering, and with the largest flowers.

Hymenocallis caroliniana (L.) Herb., has been reported from east Texas woodlands near the Sabine River, but I have never been able to confirm this. Where *H. caroliniana* overlaps with *H. galvestonensis*, the differences may blur, and in areas of high summer rainfall the foliage of the latter may persist until after flowering, making it appear similar to *H. caroliniana*. In shaded woodlands the usual dull, glaucous foliage may be greener than in sunny, open areas. Such inconsistencies require further study.

1. *Hymenocallis galvestonensis* (Herb.) Baker

Syn. *Choretis galvestonensis* Herb. AMARYLLI. 221-222, t. 41, figs. 34 & 36. 1837. Type Drummond 412. Galveston Bay, Texas.

H. uelae Shinnars, FIELD AND LABORATORY, Vol. XIX, No. 2. Pp. 102-103, 1951.

H. moldenkiana Traub, PLANT LIFE, Vol 18, p. 71, 1962.

2. *Hymenocallis lirisme* (Raf.) Shinnars. Field and Laboratory, Vol. XIX, No. 2, pp 102-103, 1951.

Syn. *Pancratium lirisme* Rafinesque. FG1. LUDOV. 19.

1817. Description only. No type plant or figure given at that date.

Hymenocallis galvestonensis Baker, non Herb., HANDBOOK

OF AMARYLLIDACEAE. p. 126, 1888. Type. Hall 630.

H. galvestonensis (Herb.) Baker, T. Howard emmend
August 4, 1989.

Bulb ovoid, 5.5cm wide, 6.5cm high; leaves deciduous, ripening in midsummer before anthesis, lanceolate-elliptic, sub-acute, glaucous, widest at the middle; scape 50cm tall, 4-5 flowered, with spicy fragrance, 1.5cm at base, 1.2cm at umbel, compressed-oval, oval or rounded in cross section; spathe valves 4, 4cm long, 1.5cm wide, tepal tube 7-8cm long; staminal cups pure white, funnellform, 3cm long, 3cm wide; segments 8cm long, 5mm wide, margins with 1-2 denticulations; filaments 3cm long, white; anthers initially introrse, becoming versatile with age; pollen yellow; style 6-7cm high in free portion. Ovary sessile. Seeds rounded, pale greenish-white.

A special thanks to Brian Mathew and David Lehmiller for obtaining Kew photos and slides of the Drummond and Hall specimens. Thanks to the SMU Herbarium for photos of specimens of *H. lirtosme* and *H. eulae*. Also thanks to Dr. H.P. Traub, Dr. Alan Meerow, Dr. David Lehmiller and Dylan Hannon for their critiques and constructive suggestions. Thanks too, to the late H.P. Traub for valuable criticisms and advice. And finally thanks to the late Dr. V.L. Cory for stimulating and encouraging my interest in this subject. Without these people this paper would not have been possible.

LITERATURE CITED

- Baker, John G. 1888. HANDBOOK OF THE AMARYLLIDACEAE, p.126. *H. galvestonensis*.
- Bauml, James. 1979. A STUDY OF THE GENUS HYMENOCALLIS (AMARYLLIDACEAE) IN MEXICO. M.S. dissertation, Cornell Univ.
- Dorman, Caroline. 1961. Native *Hymenocallis*. PLANT LIFE Vol. 17, pp. 41-42. fig. 8.
- Dorman, Caroline. 1962. Louisiana *Hymenocallis*. PLANT LIFE, Vol. 18, pp. 46-47.
- Flory, W.S. 1978. Known Distribution of *Hymenocallis* Salisbury in North and Middle American and the West Indies. PLANT LIFE 34, pp. 47-59.
- Herbert, William. 1837. *Choretis*. AMARYLLIDACEAE, pp. 219-221, plate 41, fig. 34, 35 and 36; plate 35, fig. 1.
- Howard, Thad M. 1952. Some Texas Amaryllids. PLANT LIFE, 8:pp. 121-124.
- Howard, Thad M. 1978. New *Hymenocallis* from Mexico. PLANT LIFE 34: pp. 60-68.
- Howard, Thad M. 1979. *Hymenocallis chiapasiana* species novum.

- Howard, Thad M. 1981. *Hymenocallis astrostephana* species novum. PLANT LIFE 37: 89-91.
- Howard, Thad M. 1982. *Hymenocallis maximilianii* species novum. PLANT LIFE 38: 38-41.
- Howard, Thad M. 1990. Two New Mexican Species of *Hymenocallis* Salisb. (Amaryllidaceae) HERBERTIA 46(2): 101-104
- Meerow, Alan. 1990. FLORA OF ECUADOR. pp. 24-26.
- Meerow, Alan. 1988 . Flora of Florida.
- Rafinesque. 1817. FL LUDOV. 19.
- Sealy, J.R. 1954. Review of the Genus *Hymenocallis*. KEW BULLETIN 2: 201-240.
- Sealy, Robert J. 1954. Review of the Genus *Hymenocallis*, KEW BULLETIN No. 2, pp. 201-210.
- Shinners, Lloyd H. 1951. North Texas Species of *Hymenocallis*, FIELD AND LABORATORY, Vol. XIX, No. II, pp. 102-104.
- Small, John Kunkel. 1933. MANUAL OF S.E. FLORA. pp. 321-325.
- Traub, H.P. 1962. Key to the Subgenera, Alliances and Species of *Hymenocallis*. PLANT LIFE 18, pp. 55-72.



Figure 1. *Hymenocallis galvestonensis*, plants showing spring foliage, Crockett County, Texas.

Photo: D. Lehmillier



Figure 2. *Hymenocallis galvestonensis* flowering in habitat.

Photo: D. Lehmiller



Figure 3. *Hymenocallis lirisme* flowers.

Photo: T. Howard



Figure 4. Cross sections of *Hymenocallis galvestonensis* flower stems and seeds.

Photo: T. Howard

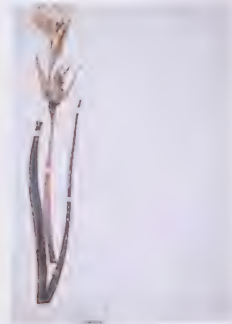


Figure 5, left. Drummond 412 herbarium specimen. Figure 5, center. Drummond 370 herbarium specimen. Figure 5, right. Hall 630 herbarium specimen. All at Kew Herbarium.

Photos: D. Lehmiller

LIVING JEWELS: NUMBER 1 IN A SERIES

TECOPHILAEA CYANOCROCUS

Charles E. Hardman, Baldwin Park,
California, United States of America

Upon learning that a plant is rare or uncommon, it's easy even for a seasoned gardener to assume: "it must be difficult to grow", and to further assume: "I probably couldn't grow it." Such assumptions are a kind of prejudice. Their conclusions are often wrong.

My case in point of the instant is the legendary *Tecophilaea cyanocrocus*. For those of you who have never been privileged to grow and bloom your own *Tecophilaea* or to see one in bloom, let me assure you that all the rave notices you may have heard or read about this little cormous plant with its shocking blue flowers still don't do it justice.

In spite of its size, diminutive when compared with many of the world's bulbous plants, *Tecophilaea* manages to capture the hearts of bulb collectors who see it, not only with its beauty and dazzling floral display, but with its mystique. It is, after all, no longer known in the wild, alas, having been collected, and perhaps grazed, out of existence — or so the story goes.

Now it is indigenous only to the growing benches and gardens of bulb collectors worldwide. Whether it is rare, uncommon, or even plentiful in these locations I do not know. What I do know is that this lovely plant, sometimes erroneously called by its nickname, the Chilean Blue Crocus (it is not a crocus), has proven fairly easy of cultivation, bloom and even seed setting upon my own growing benches once I learned how to grow it.

My original corms of *Tecophilaea* were purchased in the early 1970s for the princely sum of \$4.50 each. (I have since seen a notice of a bulb auction in which the suggested opening bid for one *Tecophilaea* corm was \$29.00.) I bought one corm of each of the varieties available: *T. cyanocrocus*, *T. cyanocrocus* var. *leichtlinii*; and *T. cyanocrocus* var. *violacea*. In those days, \$4.50 for a corm the size of a green pea was a real budget buster for me. My checking account moaned and berated its fate, especially when it heard about the diminutive dimensions of those corms.

Yet I have never regretted my decision. Not even when those small corms refused to bloom for two years, nor then when one of them produced only one weak, definitely poor-quality flower during its third season. It didn't matter. The leaves themselves were interesting: slightly fleshy and quite short, not at all what I had

expected when I planted the corms. And I was awe-struck from the moment I set eyes on the flower. I became an instant fan who has championed the species ever since.

The plant grower in me immediately proclaimed success in my mastery over the species when that lone flower produced one lone seed. I had done it! I had successfully grown and bloomed the rare *Tecophilaea cyanocrocus* and even set a seed on it. On to the next bulb species challenge!!

Ah, youth and its exuberance over small successes. If only we could breeze lightly through the next part of my story. The truth is that the following ten years brought few flowers and only moderate success. That first seed sprouted and quickly died. The original corms grew in increments measured in millimeters. All this amounted to success of a sort, yes. But hardly a success which one could call "resounding".

In the early 1980s I began experimenting with crushed granite sand as a medium for growing bulbs. There were several reasons for this. Among them was the fact that I had read that crushed granite sand contains a high percentage of potassium — from 7% to 17% potassium

stated one article. As bulbs tend to love potassium, the granite sand sounded like a good candidate for a growing medium.

Other reasons for my wanting to experiment with granite sand were: 1. the fact that a sand and gravel pit is within five miles of my home, so I can purchase quantities of the stuff comparatively inexpensively;

2. my conclusion that organics (peat moss, bark, organic soil mixes) had been causing the death of increasing numbers of my bulbs when white salt crusts from irrigation water concentrated on the organics, presenting increasingly dangerous levels of salts in contact with the bulbs as soil dried out for summer dormancy;

3. the ease of simply pouring sand into a pot, plunking the bulbs in, and fertilizing when necessary; and

4. granite sand straight from the sack is fairly free of disease organisms, so sterilization before planting bulbs or seeds is usually unnecessary. (If you try this method of growing bulbs, stuff some fiberglass house insulation into the drainage holes in the pots to prevent the sand from leaking out. Here in the United States, house insulation is pink or creamy yellow in color, cottony, holds up well and certainly prevents the sand from escaping through the holes. ***Note: wear a mask while you're handling the insulation; once in your lungs, the fibers can make you cough for hours afterwards. Further note: some people have skin sensitive to this insulation, so please wear gloves.***

For the most part, the granite sand helped me to grow my bulbs wonderfully, so within three years most of my winter growing bulb collection had been transplanted into this all-granite sand growing medium. A top dressing of organic soil mix consisting primarily of finely chipped bark and peat seems to help the plants grow better. This topdressing is scraped off — along with any weed seeds — and replaced on a yearly basis.

While I am pleased with granite sand as a planting medium for most winter-growing bulbous species, granite sand doesn't work well for all species. It seems to be a bit too neutral or perhaps a bit on the alkaline side at first for those bulbs which want a slightly acidic growing medium. A silica sand/granite sand combination works better for these species. In extreme cases where the bulbs were obviously suffering, I simply went back to a peat moss or a bark-chip commercial soil mixture mixed in with the sand and replaced periodically through repotting.

The *Tecophilaea* thrived in the crushed granite sand. They grew even better when I began fertilizing them four times each winter growing season with a fertilizer mix of potassium sulphate, potassium nitrate, superphosphate and a small amount of magnesium sulphate (Epsom salts available in any super-



Tecophilaea cyanocrocus

Photo: Charles Hardman

market or pharmacy) and a bit of chelated iron. Sometimes when I have some available, I splurge and give all my growing bulbs a bit of chelated trace minerals as well, or maybe a shot of calcium nitrate. But I find the crushed granite sand seems to have plenty of trace minerals in it for most bulb species most of the time.

If you were to ask me what proportions I use in my fertilizer mixture, I'd be at a loss. Like cooks who have been cooking for a long time, I just mix up a batch from time to time and feed often — four or five times during a growing season — but sparingly.

The corms of *Tecophilaea* reproduce slowly. They do reproduce, however, and in time the cormlets tend to form small colonies around the mother corm. These should be separated and planted elsewhere during dormancy every three years or so.

Surprisingly, my *Tecophilaea* corms produce copious quantities of seeds. From my small group of corms, using hand pollination with a camel's hair brush — several times for each flower — the plants produced 180+ seeds last year (winter of 1993/1994), up from 150+ the year before. The seeds are round and about the size of a small *Ferraria* seed or a large *Freesia* seed.

But getting plants to produce seeds was an easy task compared with getting seeds to germinate. I labored for years with this problem, faithfully planting seeds in the granite sand in which their parents grew so well. Yet their germination rate remained oppressively low: one, two, or three seeds per every forty planted. Not good!

Then serendipity took center stage. I had given some *Tecophilaea* seeds to my friend, Charles Gorenstein, who planted them and several months later casually mentioned to me that every one of his seeds had germinated and were growing.

"What did you plant them in?", questioned I.

"Supersoil", answered he.

Eureka!

In October 1994, I planted my own *Tecophilaea* seeds in Supersoil. Now, January 7, 1995 one pot of 40 has fourteen seeds germinating, while in another pot of 40, ten seeds are germinating. The Supersoil sack lists its pH as 5.5 to 6.5, mildly acidic. [Ed. Note: Supersoil™ is made from ground bark and has some sand added. It is a very porous mix.]

Could the acid level of the Supersoil be the clue? Probably.

My guess is that crushed granite sand, while it's fine for growing the corms, simply isn't sufficiently acidic to germinate the seeds well.

Bulb species are just full of surprises, aren't they?

I would encourage anyone to try their hand at a few *Tecophilaea* seeds. They have been available through the International Bulb Society seed exchange list from time to time. I hope we can continue to produce them in sufficient quantities to list them every year. (No seeds from my plants will be available for the 1995 seedlist...see "Further update" below.) In spite of the rare or at least uncommon status of this plant, it is not difficult to grow. In climates colder than Southern California I suspect a cold frame or cool greenhouse would be in order.

Once you grow *Tecophilaea*, you'll look forward to seeing it bloom each year. In time, you too may wish to contribute corms or seeds toward the effort to re-establish it in the wilds of Chile.

In the meantime, I hope you may enjoy good growing of one of Nature's living jewels.

Update: final count of germinated seeds in pots mentioned above were 27 germinated seeds out of a first group of 40 seeds planted; 16 germinated seeds out of a second group of 40 planted.

Analysis: *Tecophilaea* seed germination was not spectacular when planted in Supersoil, but still far better than when planted in straight granite sand. In addition, there is a good chance that even more seeds will germinate next year in the same pots; one or two seeds per forty planted often retain their viability through the summer after planting and germinate for me in the second year even when planted in the original granite sand medium.

Further update: for reasons best known to the *tecophilaeas* themselves, only one flower bloomed for me during the winter of 1994/1995. The corms had a hard time getting started and grew slowly until winter was well under way. Then the leaves grew robustly and the plants ended the season looking very good. I expect to have many more flowers during the 1995/1996 winter.

Further analysis: the *tecophilaeas* may have decided not to bloom well during the winter of 1994/1995 as a result of the wisdom behind the old folk saying "Good tomatoes, poor cucumbers this year...last year it was the reverse", the message of which seasoned gardeners the world over carry in their hearts: Some species and some varieties just do *not* grow well during certain years.

While Southern California's climate is usually wonderful, the weather itself is often bizarre. October of 1994 was hot, followed by an unusually cold November with many nights of frost (down to 22°F two nights in my bulb growing area). A cold November was followed by an unusually warm, dry December. January was warm and rainy. February was warm, then hot and unusually dry throughout. March was stormy, rainy and cold, then sunny and warm, then hot. Is it any wonder many plants were confused?

Although the '94-'95 winter rainfall turned out to be especially plentiful, some species of bulbs, such as the *tecophilaeas*, performed poorly. Their poor performance was probably a result of the wildly fluctuating, and often reversed, temperature patterns: cold to cool when it should have been warm, and vice versa. Other winter growing species thrived in this strange weather and grew, bloomed and set seed beautifully.

Conclusions: *Tecophilaea* is easier to grow and bloom and even to set seed upon — during most years — than its scarcity implies. As with all plants, each grower can profit from the wisdom of other growers, but ultimately each grower must discover what makes these cormous plants grow best under his or her own conditions.

GROWING HYBRID LILIES

Eugenia Dunbar
Pasadena CA, United States of America

Would you like to grow lilies — the hybrid types? They're easy, fun and beautiful. Lilies (hybrids of the genus *Lilium*) come in three classes:

1. Asiatic — bloom June - July,
2. Aurelian — bloom July - August,
3. Oriental — bloom August - September.

Most nurseries offer lily bulbs in early spring. They come bare-root, packed in peat or shavings and are ready to plant. Lily bulbs are alive and they grow all the time. So, select a spot with light shade, then prepare a plot (a raised bed is great) or a container. Use a rich, humus containing, well draining soil, a little on the acid side with a pH of 5.5-6.5. Add some perlite for good drainage. Plant bulbs so they can be covered with 3-4 inches of soil.

Place the bulb or bulbs in the prepared mixture, dusting with a fungicide if desired. Ortho puts out a fungicide for roses that works well. Cover dusted bulbs with perlite and then the remaining prepared soil. Label the plants if you have the names or description. Now water well and then as often as needed.

When the days begin to warm, a shoot will appear. At that time you can give them a dilute nitrogen fertilizer. When the stalk is about 12 inches high, stake it, and use a fertilizer higher in phosphate (i.e. superphosphate) and potash (potassium). Miracle Gro is fine. From here on care for them much as you would your roses: water, feed and spray to keep them clean and healthy. They will reward your tender loving care — just don't stop. Your joy will be exhilarating to the point of disbelief.

Since each year a lily bulb sends up only one stem with small leaves on it, that stalk should be cherished. Never cut off a lot of the stem; the leaves are needed to produce next year's bulb. However, the joy of lilies' beauty and fragrance will suggest ways of arranging the flowers for your home and patio.

If you resist cutting your lily flowers for a bouquet and you let them grow on the plant, cut off spent (dead) blossoms and discard them. The stalk and leaves should stay on the plant until they turn brown in autumn.

Lilies almost never need to be divided. In cooler climates they will require a mulch when the temperature drops to freezing. In California a mulch in the summer will keep the soil moist and cool — or use groundcover plants around them. In warm winter areas the Orientals should be vernalized (prepared for spring: kept in a cool, dark place) for about four to six weeks, after which the growing process resumes.

See the Source Guide on page 110 for names and addresses of bulb suppliers and lily societies.

ALBUCA

William T. Drysdale
Riverside CA , United States of America

Albucas are a numerous lot, mostly undistinguished, from South and tropical Africa. They are reminiscent of *Ornithogalum* to which they are closely related. The two best known species are *Albuca crinifolia* and *A. nelsoni*. For many years the former Oakhurst Gardens of Arcadia, California in Los Angeles County, offered these, and Mrs. Emma Swets grew both. They are, because of their size, imposing plants. In both instances the flowers are pure white with a green stripe on the exterior of each petal. *Albuca crinifolia* grows about three feet tall. *Albuca nelsoni* is even bulkier, throwing a flowering scape up to six feet. Its foliage differs from the light green of *A. crinifolia* in being blue-green and five feet long. Neither is widely cultivated in Southern California. They may be described as imposing, striking, unusual or curious.

Beautiful they are not, although *A. crinifolia* has the virtue of exuding the fragrance of almonds during the warm part of the day. The main bulb tends to break up after flowering several times and at that time they are best dug and divided so as to build up the size of the bulbs again. *Albuca crinifolia* and *A. nelsoni* are rated the most handsome of the genus.

Another species, *A. fragrans*, may also be redeemed by its fragrance. It is much smaller, sporting a flower scape of only 30 inches, half of which is covered by half inch flowers of sulphur yellow. It is tantalizingly described as being deliciously scented.

GETHYLLIS CULTIVATION HINTS

Rust-en-Vrede Nursery, PO Box 753, Brackenfell 7560
Republic of South Africa

Use a 15cm pot. Place a layer of stones at the bottom, then fill with a mixture of very coarse sand (that drains well) to which a spoonful of bonemeal may be added. Pour boiling water over the mix to sterilise it before planting the bulbs about 6cm deep. Keep the pot out of the rain in a bright situation, but do not let the pot get baked in the sun. Water the pot once every two weeks. The sand will dry out without any harm to the bulbs. A seaweed extract fertiliser may be added to the watering every few weeks, or "slow release" fertiliser grains may be added to the soil. From early summer until autumn the pot must be kept dry. The leaves will dry off. The flowers appear some time in late summer.

CULTURE PAGE

You say your bulbs aren't growing or blooming properly?

Did you remember to:

- Plant them in the correct pot size or garden area?;
- Plant them properly in the right soil mixture?;
- Water them correctly?;
- Give them sunlight according to their needs?;
- Fertilize them according to their individual needs with a good bulb fertilizer?;
- Observe them frequently for pests and problems?;
- Provide them with adequate drainage?;
- Give them the correct temperatures for their various stages of growth?;
- Provide them with conditions simulating their native habitats as closely as possible? Do you know where their native habitats are?);
- Allow the dormant types to get adequate rest during their proper dormant season and keep the evergreen types growing?;
- Consult a good gardening reference book?;
- Adjust the recommended treatment given in your reference book to your particular growing conditions?

If you did and your bulbs still aren't growing and flowering properly there are many bulb books available from your local library or for purchase that will give you good cultural advice. Two excellent bulb books are reviewed in this journal, beginning on page 118.

Good advice can often be obtained from agricultural agents (country and state), local arboreta and botanical gardens or other growers in your area. Horticultural societies have members familiar with local problems and solutions. Gardening friends and pen pals are other good sources of gardening information.

But remember, common sense and gardening instinct combined with a broad knowledge of your own growing conditions, tools and equipment as well as a working knowledge of the bulbs themselves are the bases of all future gardening success.

In spite of the problems presented above, most bulbs are easy to grow and bloom. Bulbs are, quite simply, wonderful!

NOTES ON CROCUS (IRIDACEAE) IN SYRIA AND JORDAN

Helmut Kerndorff
Berlin, Germany

ABSTRACT

Field studies of *Crocus* species in Syria add a new location and new information to our knowledge of the little known *C. pallasii* ssp. *dispathaceus*. Locations of *Crocus pallasii* ssp. *pallasii* Goldb., *C. kotschyanus* K. Koch and *C. cancellatus* Herbert were investigated. In larger populations, especially of the latter species, a statistical treatment of findings concerning the relation of style length to anther length as well as the corm neck extension was made.

In Jordan, results of field studies concerning *C. hermoneus* lead to the assumption that the division into ssp. *hermoneus* and ssp. *palaestinus* is not justified. A new location for *C. hermoneus* was found; in this locality the corm tunic of this species was found to exhibit a broad spectrum of variation from "typical *hermoneus*" to "nearly *cancellatus*", unlike those of the more southern habitats which have corm tunics typical for *C. hermoneus*. *Crocus hyemalis* was investigated in detail with regard to the colour of the anthers.

INTRODUCTION

Large areas of the Near East belong to the steppe and desert climate zones and only parts of the westernmost ridges, particularly the "coastal mountains", have a subtropical climate. Most important in this respect is Jebel Ansariya, up to 1562m (Syria), Mt Lebanon, up to 3083m (Lebanon and Syria), Mount Hermon, up to 2814m (Syria, Lebanon, Israel), the Golan Heights, up to 1204m (Syria, Israel) and the mountains east of the Jordan Valley and of Wadi Araba, up to 1736m (Jordan).

The elevations are on an average well above 1000m and precipitation is mainly in December (NW Syria) and January (all other areas), with amounts of over 1400mm on Jebel Ansariya in Syria (Figure 1). Most of the *Crocus* species occurring in the Near East grow in these mountains (Kerndorff 1988). An exception in Syria is *C. pallasii* ssp. *turcicus* B. Mathew (= *C. macrobolbos* Jovet & Gomb.), which is recorded from Tadmor (Palmyra) in the Syrian desert and Jebel Abd I Aziz, a mountain ridge approximately 480km northeast of Damascus.

Important contributions to the knowledge of *Crocus* species in Syria were made by Post (1897), by Post & Dinsmore (1933) in the FLORA OF SYRIA, PALESTINE AND SINAI (first & second editions) and by Mousterde (1966), in NOUVELLE FLORE DU LIBAN ET DE LA SYRIE.

However, there have been very different observations made by collectors in the region and contradictory descriptions of collected plant material and this has led to taxonomic confusion of the *Crocus* species of Syria. Some problems still remain, though many of them were clarified by Mathew (1982) in his monograph of the genus. In this paper some new information is added and some light is shed on certain aspects of *Crocus* species in Syria and Jordan.

A. *C. pallasii* ssp. *dispathaceus*

Crocus dispathaceus was the name proposed by E.A. Bowles (1924) for a very distinct crocus distributed as "*C. tauri*" by Georg Egger of Jaffa, a nurseryman who specialized in the bulbous plants of Asia Minor. The "type" is a specimen of unrecorded origin collected or cultivated by him. The herbarium specimen at Kew bears the label "*C. tauri*, Aleppo?, Comm. G. Egger Jr., 17th Dec. 1912" (Mathew and Baytop 1976). The only specimens of *C. dispathaceus* known to exist up until 1973, other than the type, were made at Kafr Hamra near Aleppo in 1931-1932 (Paris Herbarium) and in 1950 in the American College grounds at Aleppo. In 1974 this *Crocus* was again collected in this area after enquiries were made concerning its continued existence there (Mathew and Baytop 1976). Until this time it was not known if this taxon occurred as a true native in Syria or whether it was introduced, perhaps by Egger. In recent years it has been discovered in the Turkish Cilician Taurus mountains by T. Baytop in the vicinity of Mersin (Mathew 1977) but this form is not so dark violet-red in colour as the original plant of Egger.

Bowles (1924) related this *Crocus* to the "*sativus* group" (Series f, *Crocus*, of Section A in Subgenus 1; after Mathew, 1982) in spite of having two prophylls instead of one, which would be unusual in this subgenus. Whether this plant normally has two prophylls (Mathew, 1982, found only one in the specimens he dissected) must remain an open question for the time being, because no plant of the material recently collected by myself was dissected: it was considered more important to conserve the living specimens of this apparently endangered *Crocus*. It should first be established in cultivation, then the remaining questions on the morphology of the species can be resolved using cultivated material.

The taxon was treated as a species until 1982 when Mathew placed it as a subspecies of *C. pallasii*, but no living plants from Syria were available at that time to verify this status.

Crocus pallasii ssp. *dispathaceus* was found by me at the end of November 1987 at two locations in Syria, one in the vicinity of Aleppo and one southwest of the city of Ma'arrat an Nu'man (Figure 1), approximately 100km south of Aleppo, which clearly

indicates that this plant is a native of Syria. Whether or not its status as a subspecies of *C. pallasii* is justified must remain unanswered for the time being. Flowering individuals of *C. pallasii* ssp. *dispathaceus* from Aleppo were very scattered, both in the area between fields and within the wheat fields. The wheat was at the time only up to 20cm in height, thinly sown and had fully developed ears. Most flowers of this *Crocus* were dark red-violet with relatively narrow segments as can be seen in Figure 2a., but one plant was found to have a segment width of 1.1cm and a very strong red-violet colour (Figure 2b).

The plants from Ma'arrat an Nu'man were found also between and in fields but were of an even darker violet (Figure 2c), sometimes with a brown, gray (figure 2d) or rosy tinge with mostly very narrow segments. Both locations lie in an area with only 350mm annual precipitation which is close to the border of the Syrian desert (Figure 1). It seems that *Crocus pallasii* ssp. *dispathaceus* avoids areas with higher precipitation in western Syria, which may reach more than 1400mm annually on Jebel Ansariya.

Field studies showed that all the plants flowered before the leaves emerged. Their height above ground is only 5-8cm. The flowers open out flat (starlike) or the perianth segments curve down in full sun, as in *C. angustifolius* Weston. They are visited by small, black beetles and an unidentified dipteran. The style branches were always much shorter than the anthers and always lemon-yellow; no red styles were observed in approximately 150 individuals. From the randomly collected individuals (13 from Aleppo, 26 from Ma'arrat an Nu'man) the corm neck extension was measured and statistically treated. Results are shown in Figure 3. The average length (cm) is $(2.5) 6.1 \pm 2.1$ (11). Most individuals (31 of 39) have a corm neck extension of 4-8cm which is about the same as that given by Mathew (1982) of 3-7cm. The capsule is elongate, ovoid, 2.1-2.6cm long and about 1cm in diameter. The seeds are irregularly subglobose, 4-5mm diameter, and the testa red-brown with a distinct, rosy-violet tinge, generally lighter in appearance than in all the other taxa of this series. An ESR-photograph (Figure 4a) of the seed testa of *C. pallasii* ssp. *dispathaceus* shows a surface structure which is typical for *C. pallasii* ssp. *pallasii* (Figures 4b and 4c) as well as for other species of this series. It is covered with needle-like projections which are significantly twisted, but the "needles" seem to be slightly longer than in *C. pallasii* ssp. *pallasii*.

In cultivation, the collected plants from Ma'arrat an Nu'man seem to be more vigorous than those from Aleppo. Several specimens of the original collection were supplied to *Crocus* specialists (including B. Mathew, Kcw) as well as a lot of small one year old bulbs grown from seeds obtained the following spring. *Crocus pal-*

lasii ssp. *dispathaceus* needs, like all species of semi-desert areas, a sandy soil with good drainage and a long dry summer rest (at least from May to the middle of September). Otherwise it seems not to be a difficult plant in cultivation.

B. *C. pallasii* ssp. *pallasii*

Crocus pallasii subsp. *pallasii* was not known from Syria by Boissier (FLORA ORIENTALIS, 1884, Post (1897) or Post and Dinsmore (1933). In the latter publication a plant collected from Killis to Aleppo (N. Syria) is mentioned as *C. haussknechtii* Boiss. et Reut. But this subspecies is not known in northern Syria, which leaves an uncertainty about this record.

Mouterde (1966) mentioned three taxa for Lebanon and Syria, namely *C. thiebautii* Mout., *C. haussknechtii* Boiss. et Reuter (= *C. libanoticus* Mout.) and *C. elwesii* (Maw) O. Schwarz, which also were put as synonyms under *C. pallasii* ssp. *pallasii* by Mathew (1982). For *C. pallasii* ssp. *pallasii* under *C. thiebautii* Mout.) a description of the corm tunic was given by Mouterde (1966) which obviously fits more closely that of *C. cancellatus* Herbert ("tuniques...nombreuses, serrées, ténues, fibreuses, réticulées en un réseau très serré"). This contradiction cannot be clarified at this time due to a lack of information.

Crocus pallasii ssp. *pallasii* was collected by Werckmeister as *C. haussknechtii* above Bludan in the Antilebanon mountains, West Syria (Mouterde 1966). At this locality (Figure 1), many flowering plants could be investigated in 1987 by myself and clearly identified as *C. pallasii* ssp. *pallasii* (HK 1987/23). In general the flowers seemed to be lighter and more pink-shaded compared to races occurring in western Turkey (Figure 5a).

Results of an investigation into style length in relation to anther length and measurements of the corm neck extension are shown in Figures 6a and 6b. Most styles were as long as the anthers (56%), corms had neck extensions (cm) of (2) 3.2 ± 1.2 (6) which comes fairly close to findings (up to 2cm) reported by Mathew (1982). These features also clearly separate it from ssp. *dispathaceus*.

C. *C. kotschyanus* ssp. *kotschyanus*

Crocus kotschyanus (synonym *C. zonatus*) has been known for a long time to occur in NW Syria. Mouterde (1966) mentioned the unfortunate nomenclatural confusion with *C. cancellatus* caused by the fact that there were two *Crocus* taxa named after Kotschy: *C. cancellatus* var. *kotschianus* Herbert (1847) and the unrelated *C. kotschyanus* Koch (1853). The author found *C. kotschyanus* growing in the Jebel Ansariya above Haffee from about 1300 to 1400m (Figure 1). High amounts of precipitation occur in the

summit region (> 1400mm). *Crocus kotschyanus* grows together with *C. cancellatus* on shaded ground under shrubs or *Juniperus* trees which are full of moss and lichens. On the whole, the plants which were investigated were fairly uniform and were identifiable with subsp. *kotschyanus*. However, all the individuals had pure white styles (Fig. 11), rarely dissected into more than three branches, making them somewhat different from the races in the central Taurus Mountains of Turkey which have orange-yellow, distinctly dissected styles.

D. *C. cancellatus*

Crocus cancellatus is mentioned in all the major publications on the flora of Syria although it is given varying status and is treated in various ways, with variants sometimes described as infraspecific taxa, species, subspecies and forms. Thus it is difficult to understand the details of variation in cytology (Brighton 1977), habitats and climate of this extremely variable species. *C. cancellatus* in all its "variants" is supposedly the most widespread autumn-flowering species in Syria. It was found in some 15 localities with very different numbers of flowering individuals (Figure 1).

It was not possible for me to separate subspecies *damascenus*, which is known from near Damascus, from subspecies *cancellatus*, though some corm tunics were found to be very coarse with interspaces of the reticulations measured to 6mm and more.

Mathew (1982) gives for ssp. *cancellatus* a style divided into many branches and usually overtopping or sometimes equalling the anthers; for ssp. *damascenus* a style divided into rather few branches (but more than three), often shorter than the anthers. No corm neck measurement is mentioned for ssp. *cancellatus* but is given as up to 6cm for ssp. *damascenus*.

Three well separated populations (west of Damascus, west of Masyaf and east of Haffée) were investigated statistically using these characteristics (Figure 7). Most plants from west of Damascus (Figures 7a and 7b) and west of Masyaf (Figure 7c) had styles much exceeding the anthers (58% and 74% of individuals, respectively), approximately one third had styles equalling the anthers (35% and 24% respectively) and only a small percent of individuals had styles clearly shorter than the anthers (7% and 2%, respectively). In the population east of Haffée, the number of plants in which the style length was equal to that of the anthers was similar to the number with styles clearly overtopping the anthers (44% and 52%, respectively). In all other localities shown in Figure 1 (e.g. Arika, Aleppo, Ma'arrat an Nu'man) similar observations were made but insufficient numbers of flowering specimens could be found for statistical treatment. The corm neck extension also varies considerably as can be seen in figures 7d

and 7e. Most of the individuals (34 out of 39) had a corm neck extension between 2 and 3.5cm, none of them longer than 3.5cm.

From the results of these statistical findings it seems that only subspecies *cancellatus* occurs at these localities and I wonder if this is possible. The use of additional characteristics of the flowers to find distinctions between subspecies was also useless, because all flowers from all locations varied considerably in shape, colour, markings, stripes, straw-colouring of outer three segments, length and width of segments, colouring of throat, division of style, etc. Other ways to help clarify the problem may be a detailed cytological study of plants of that area and scanning electron micrographs of seed and pollen surface microstructure. The results of, for example, a cytological investigation of the "*Crocus cancellatus* aggregate" may turn out to be very complex as has already been shown by Brighton (1977).

CROCUS SPECIES IN JORDAN

E. *C. hermoneus*

A detailed description of the history of this species, its habitats and distribution as well as several morphological details were presented in a paper about *Crocus* species in Jordan (Kerndorff 1988). In 1987 many flowering plants were found in the locality near Salt (Kerndorff 1988) (Figure 5); a further locality can be reported in which *C. hermoneus* grows together with *C. hyemalis* but flowers before *C. hyemalis*. It lies in the Ajlun hills adjacent to the village of Anjara (Kerndorff 1988). Here many flowering plants could be investigated mainly for the purpose of checking the status of the two subspecies of *C. hermoneus*.

Feinbrun and Shmida (1977) proposed a subdivision of *C. hermoneus* which derived mainly from differences in the length of style in relation to the tips of the anthers, number of leaves, corm neck extensions, flowering time and chromosome number.

However, sufficient material has been studied this time, especially concerning the morphological parameters, to provide solid statistical statements. In the "Salt" locality 130 flowers and 27 corms (Figures 8a and 8b) and in the "Ajlun" locality 64 flowers and 25 corms — all randomly selected — were investigated (figures 8c and 8d). Results for both localities were very similar and showed that only 7% and 5% of the flowers respectively, had a style not exceeding the tips of the anthers, which should be the normal feature for ssp. *palaestinus*, after Feinbrun and Shmida (1977). Instead, 26% and 38% respectively of the flowers had a style which equals the anthers and 67% and 57% respectively had a style clearly exceeding the tips of the anthers. Results concerning the corm neck extension (Figures 8b and 8d) also show that most

individuals (30) had an extension of 2-2.5cm, 15 had one of 0.5-1.5cm and 6 had one of 3-3.5cm. According to Feinbrun and Shmida (1977), ssp. *hermoneus* should have an extension of up to 1.5cm and ssp. *palaestinus* between 2 and 3cm.

The differing flowering time of the proposed subspecies can be referred to different elevations and hence temperatures in which the plants occur (1600-2000m on Mt. Hermon respectively, 700-1100m in the Judean Hills/Ammon). That flowering times significantly correlate with the elevation of the habitat is well known for several *Crocus* species if they occur at low altitudes as well as in summit regions of the same area. Flowering in autumn always starts in the summit regions and ends at low altitudes, while flowering in spring is "vice versa".

Finally, the chromosome numbers were found to be different in plants from Mt. Hermon and the Judean Hills (Feinbrun and Shmida 1977) but this is not an unusual feature of species in this highly complex genus, particularly in Series (g) *Reticulati* (Mathew 1982), to which *C. hermoneus* belongs. If one takes all findings and known facts into consideration, a subdivision of this very variable species is not justified.

Instead, a new problem arises from the investigated plants of *C. hermoneus* found on the Ajlun hills. The corm tunics show a broader spectrum from "typical *hermoneus*" to "nearly *cancellatus*", unlike those of the more southern habitats which mainly have corm tunics typical for *C. hermoneus* (Figure 9). From this point of view it is understandable that Mousterde (1966) regarded *C. hermoneus* as a variation of *C. cancellatus*! Mathew (pers. comm.) suggests that *C. hermoneus* might possibly have originated by mutation from *C. cancellatus*.

Such are the problems in this genus and several remain unsolved for the time being, particularly with respect to *C. cancellatus* and its allies.

F. *C. hyemalis*

The first record of this species from Jordan was published by Al-Eisawi (1986). Another record was made in the same area — in the Ajlun hills by Kerndorff (1988). The new locality recorded for *C. hermoneus* is identical to the one mentioned for *C. hyemalis* in that paper. Flowering time was well advanced and 75 individuals were investigated concerning the colour of the anthers. Because the pollen of this species is yellow, it is likely that anthers which are originally black become more or less yellow when they split open. Flower buds were investigated in which the anthers were not yet dehiscent and it was observed that the anthers were mostly pale yellow to yellow with an almost colourless connective and a more or less developed black margin. As mentioned earlier

(Kerndorff 1988), it seems that the ones with a thin black margin, either from the upper third to the top (13 individuals, Figure 10b) or from the lower third to the top (59 individuals, figure 10c) are most prominent. Plain yellow anthers, (5 individuals, Figure 10a) or almost wholly black ones, (1 individual, figure 10d) are rarely to be found. This generally confirms the findings which were made earlier (Kerndorff 1988).

ACKNOWLEDGEMENTS

Thanks are due to Brian Mathew for encouraging me to write this paper, for his discussions concerning problems and for the intensive work he did on the review of the manuscript. Thanks are also expressed to Thomas Struppe for preparing the manuscript, to Monika Jung for preparing and styling figures and to Klaus Lobig for making scanning electron micrographs.

REFERENCES

- Al-Eisawi, D.M. 1986. Studies on the flora of Jordan, 12. Monocotyledons new to Jordan, with notes on some interesting species. Kew Bull. 41 (2): 349-357.
- Boissier, E. 1982. FLORA ORIENTALIS. Vol. 5, Geneva.
- Bowles, E.A. 1924. A HANDBOOK OF CROCUS & COLCHICUM FOR GARDENERS, First edition, Bodley Head Ltd.
- Brighton, C.A. 1977. Cytological problems in the genus *Crocus* (Iridaceae). II. *Crocus cancellatus* aggregate. Kew Bull. 32 (1): 33-45.
- Feinbrun, N. & Shmida, A. 1977. A new review of the genus *Crocus* in Israel and neighbouring countries. ISRAEL JOUR. BOT. 26:172-189.
- Kerndorff, H. 1988. Observations on *Crocus* (Iridaceae) in Jordan with special reference to *Crocus moabiticus*. HERBERTIA 44 (1): 33-53.
- Mathew, B. 1977. *Crocus sativus* and its allies. PL. SYST. EVOL. 128: 89-103.
- Mathew, B. 1982. THE CROCUS: A REVISION OF THE GENUS CROCUS. B.T. Batsford Ltd., London.
- Mathew, B. & Baytop, T. 1976. Some observations on Turkish *Crocus*. NOTES ROY. BOT. GARD. EDIN. 35: 61-67.
- Mouterde, P. 1966. NOUVELLE FLORE DE LIBAN ET DE LA SYRIE. Vol. I, Editions de L'imprimerie Catholique, Beyrouth.
- Post, G.E. 1897. FLORA OF SYRIA, PALESTINE AND SINAI, FROM THE TAURUS TO RAS MUHAMMAD AND FROM THE MEDITERRANEAN SEA TO THE SYRIAN DESERT. Syrian Protestant College, Beirut, Syria.
- Post, G.E. & Dinsmore, J.E. 1933. FLORA OF SYRIA, PALESTINE AND SINAI, Second edition, Vol. II., American Press, Beirut.

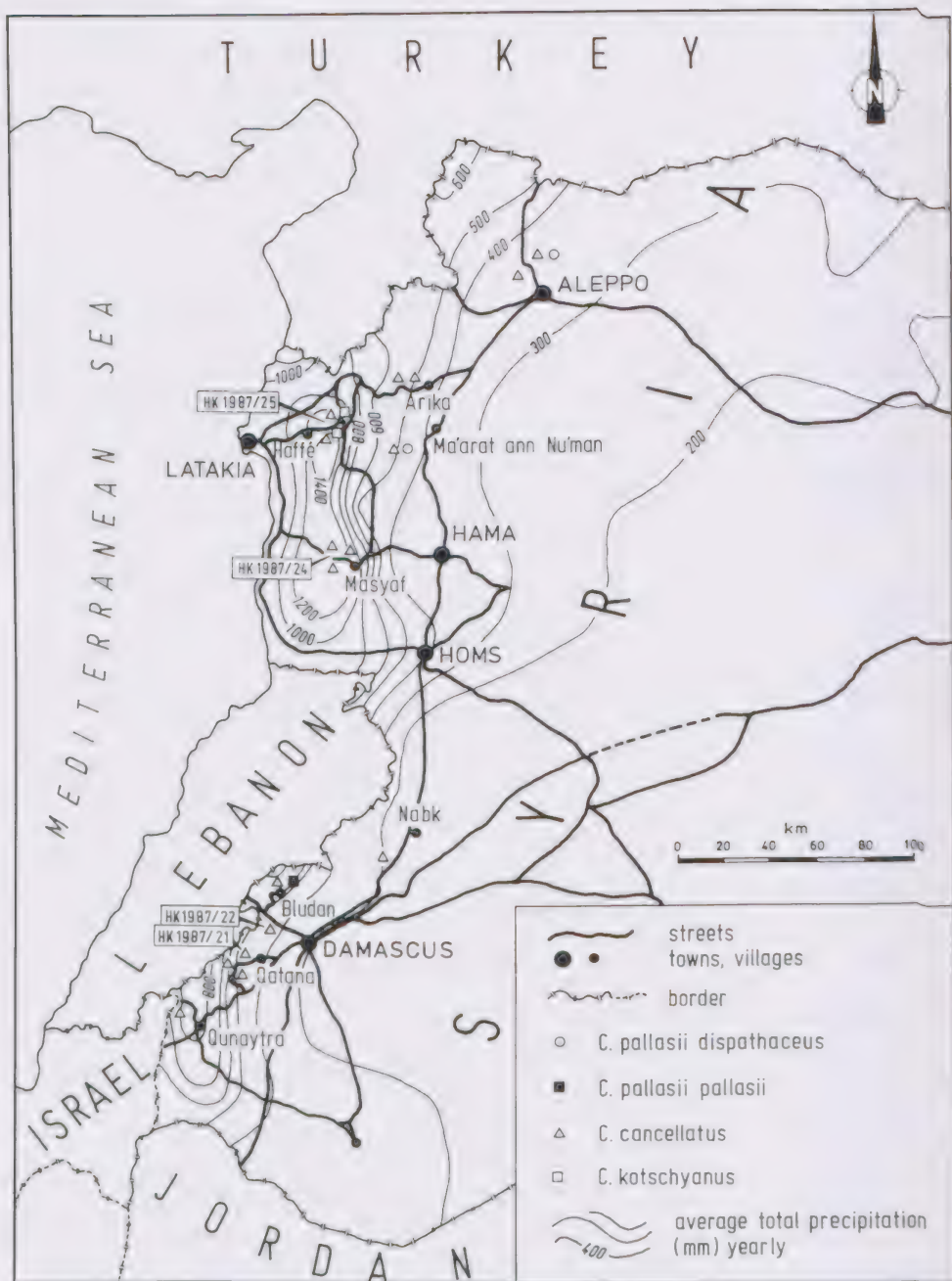


Figure 1. Map of Syria and habitats of *Crocus* species investigated.

Crocus pallasii ssp. *dispathaceus*. total number of investigated plants from Aleppo and Ma'arrat an Nu'man (n=39)

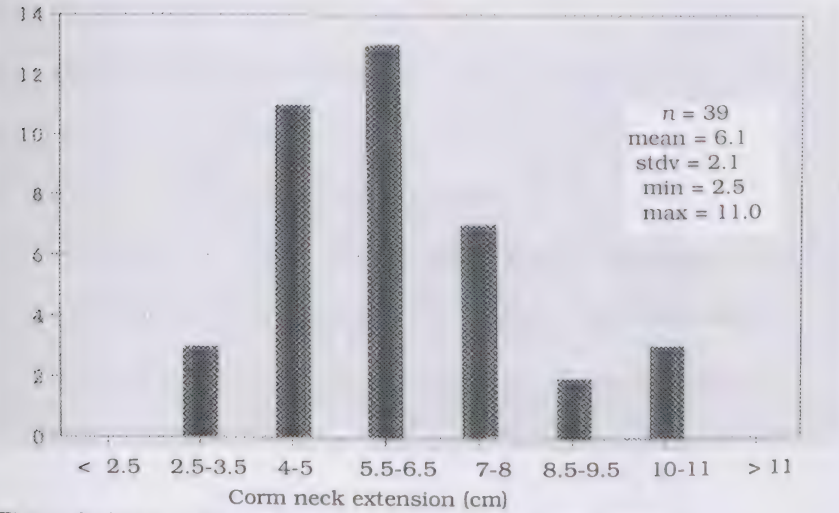


Figure 3. Corm neck extension of *C. pallasii* ssp. *dispathaceus*.

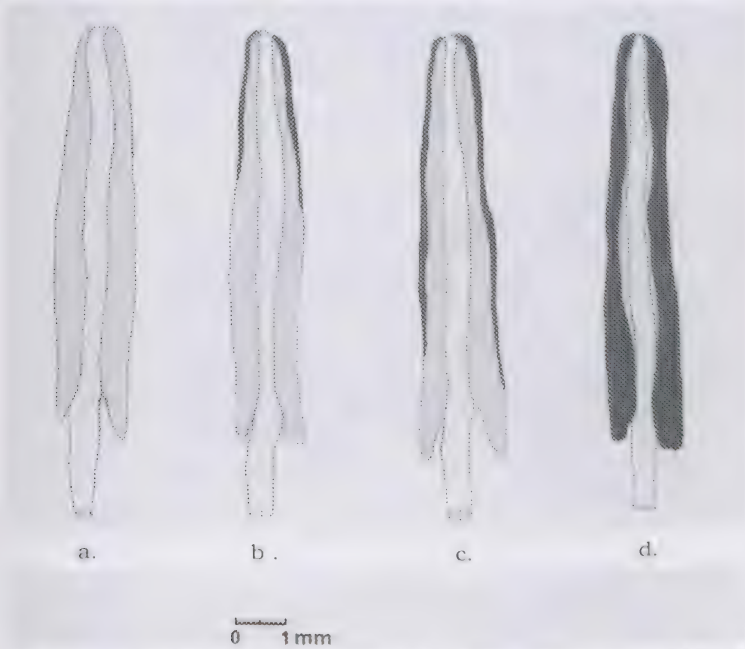


Figure 10. Variation of anthers of *C. hyemalis* from the Ajlun hills, Anjara (Jordan). Dark grey=yellow, black=black



Figure 4. ESR photographs of seed testa microstructure.
Top: *Crocus pallasii* ssp. *dispathaceus*.
Center: *Crocus pallasii* ssp. *pallasii* from Bludan.
Bottom: *Crocus pallasii* ssp. *pallasii* from Western Turkey.

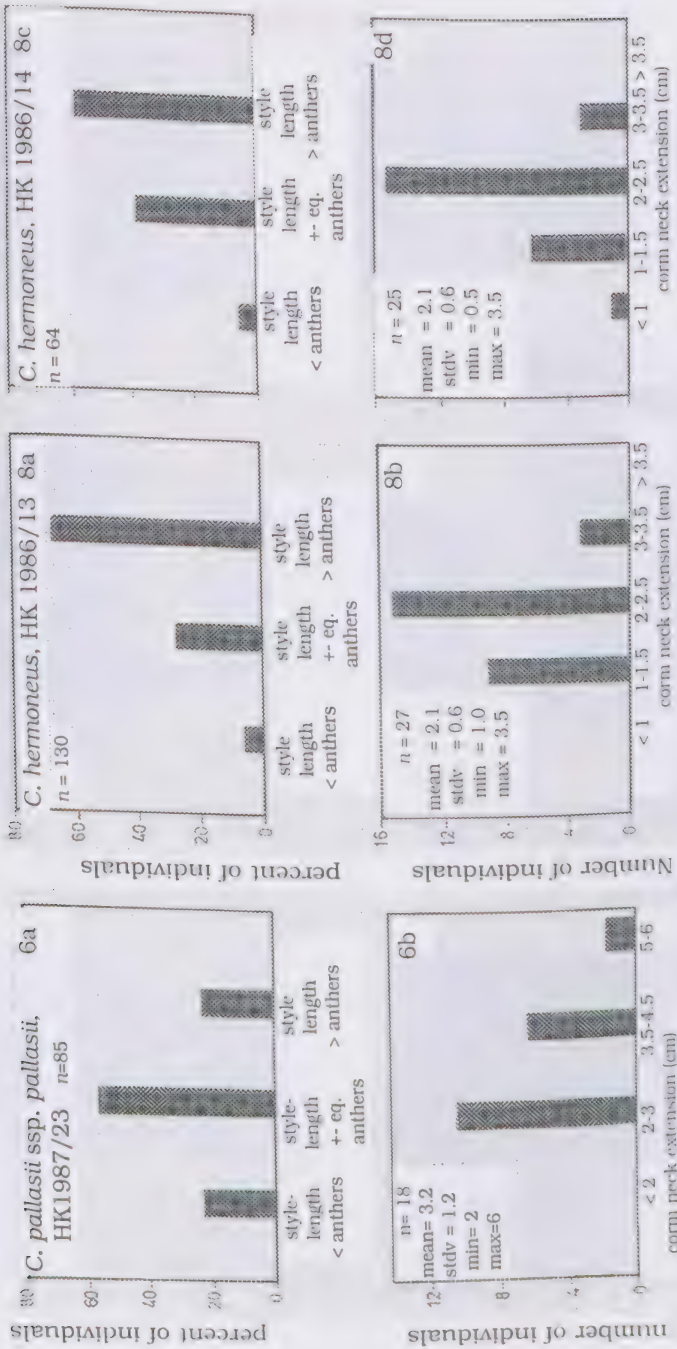
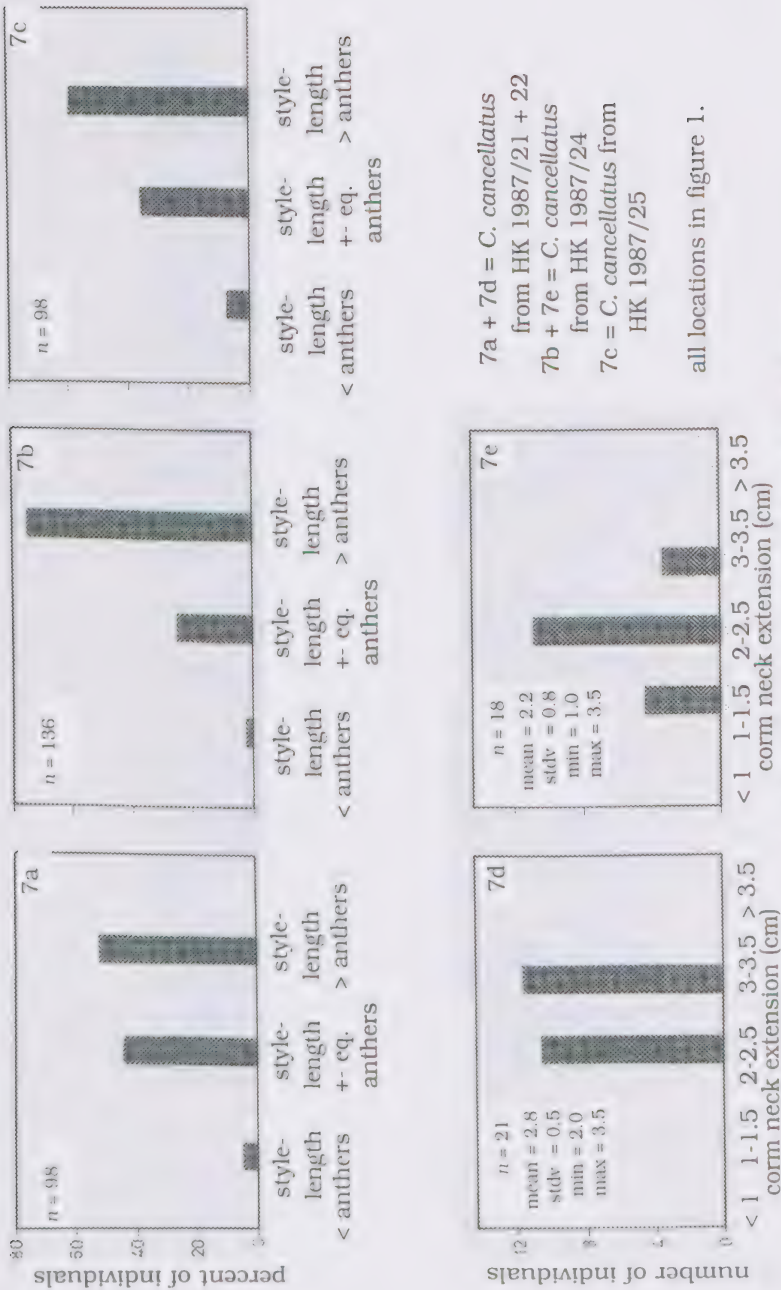


Figure 6. Style length in relation to anther length (6a) and corn neck extensions (6b) of *C. pallatii* ssp. *pallatii*.

Figure 8. Style length in relation to anther length (8a and 8c) and corn neck extensions (8b and 8d) of *C. hermoneus*.



7a + 7d = *C. cancellatus*
from HK 1987/21 + 22
7b + 7e = *C. cancellatus*
from HK 1987/24
7c = *C. cancellatus* from
HK 1987/25
all locations in figure 1.

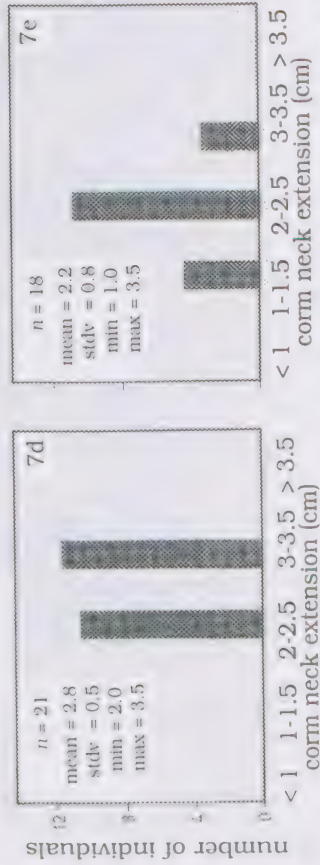


Figure 7. Style length in relation to anther length (7a, 7b and 7c) and corn neck extensions (7d and 7e) of *C. cancellatus*.



Figure 2. Variation of flower shape and colour of *Crocus pallasii* ssp. *dispathaceus*.



Figure 5. Flowering specimens of:
left, *Crocus pallasii* from Bludan;
center, *Crocus hermoneus* from Salt;
right, *Crocus hyemalis* from Anjara.



Figure 9. Corm tunic variations of *Crocus hermoneus* from the Ajlun hills, Anjara, Jordan



Figure 11. Variation of anthers of *Crocus hyemalis* from the Ajlun hills, Anjara, Jordan.

Photos: H. Kerndorff

SOME MEDITERRANEAN MONOCOTS

Michael Salmon
Avon, England

The flora of Morocco, Algeria, Tunisia, Libya and, to some extent, Egypt, has been isolated for a long period of time by the Sahara to the south and by the Mediterranean to the north. In the past, when the Sahara was forested and tropical, many new genera were initiated here. Some of these prototypes, being adaptable, were able to spread widely to the south into central Africa and north into southern Europe. The flooding of the Mediterranean basin finally closed this latter route.

A small, closely related group of primitive amaryllids evolved here, including *Hannonia*, *Vagaria*, *Lapiedra*, *Pancratium* and *Narcissus*, which became more varied and specialised as they moved away. They have a number of characteristics in common, for example flowers produced in autumn followed by narrow, strap-shaped leaves and few-flowered umbels producing seeds which ripen and fall before the onset of winter rain.

Hannonia hesperidum (figure 1) is confined to western Morocco where it is not common. It is a small plant no more than 15cm tall which prefers open, sandy-gravelly sites, always on a slope or elevated position, usually over limestone and where it has little competition from other plants. The starry, funnel-shaped flowers, white internally and green striped externally, are invariably in pairs and both open at the same time. *Vagaria olivieri* (figure 2) is found chiefly to the west of Morocco but also in the foothills of the mid-Atlas Mountains. It is smaller than the foregoing, reaching only 10-12cm with paired flowers, though strong plants in favourable years can produce up to four flowers. The segments are much wider than *Hannonia* but have a similar green-striped reverse. The filaments are winged at the base, forming a primitive corona. *Lapiedra martinezii*, confined to the Mediterranean coast of Morocco, is more plentiful in southern Spain. Generally it is found wedged in pockets and on ledges of limestone crags where, in spring, the sheaves of strap-shaped, deep green leaves with a central silvery stripe are easily spotted. The stout flower stem supports an umbel of 3-10 small, starry flowers, white internally, green externally. The stamens are particularly noticeable as they carry large, forked, deep yellow anthers. Rarely are more than one or two flowers open at the same time.

Pancratium maritimum can be found the length of the Atlantic and Mediterranean coast of North Africa. *Pancratium foetidum* is

similarly spread as far as Tunisia, but whereas the former is usually found at sea level and usually in the salt spray zone, the latter grows further inland in rocky hillside situations. The stout stems of *P. maritimum* grow to 50cm tall, carrying large umbels of 5-20 rather small, white flowers. The segments are narrow and longer than the corona, which is funnel shaped and carries the small yellow anthers along its toothed rim. Another species, *P. trianthum*, occurs from Tunisia to the Atlantic coast of Morocco in the pre-Saharan sands but I have seen only the extremely glaucous, corkscrewed leaves.

Narcissus (Tapeinanthus) humilis (Figure 3) is probably the most ancient surviving member of this genus. It, again, is a Moroccan plant but also creeps into the north of Algeria. It is found in low-lying or seasonally flooded areas, usually within sight of the sea and in heavy clay soil where the bulb sits just below the surface. Slender 3-7cm stalks carry one or two 2cm diameter, bright yellow, upright flowers. The segments are narrow and have at their base a small coronal scale. The stamens and style are very prominent. Where it occurs it is usually abundant. Flowering plants produce no leaves but utilize the elongated flower stem for photosynthetic purposes, as does *Narcissus serotinus*, which often grows with it. *Narcissus peres-larae*, the hybrid between the two is a smaller, more starry-flowered version which only rarely produces flowers. This latter can also be found in southern Spain. *Narcissus elegans*, the progenitor of the tazetta group, is found in several varieties from Morocco to Tunisia. In its eastern stations it is usually coastal, whereas in Morocco it can be found at quite high altitudes in the mid-Atlas Mountains. This species flowers with one or two narrow, glaucous, upright leaves and the 8-30cm stem carries 2-7 starry, white flowers about 4cm in diameter. They sometimes open pale greenish but soon mature to sparkling white. The corona is very short and conical, at first dark olive green, later bright orange. It has a very strong, pleasant perfume. This species occasionally hybridises with *N. serotinus* to produce *N. x obsoletus*. *Narcissus viridiflorus*, an ancestor of the jonquil group, is confined to western Morocco where it may be locally abundant in seasonally wet hollows and by streamsides, usually associated with rushes (*Juncus* spp.), which its strong leaves closely resemble. The bulbs are large and deep seated and the round, deep green flower stems, at first 15-25cm tall, carry a one-sided umbel of 2-7 small, starry, olive green flowers having a minute 6-lobed corona. Later the flower stem elongates to up to 50-60cm and functions as a leaf as none are produced.

Scilla is well represented in North Africa with about 15 species



Hannonia hesperidium



Vagaria olivieri



Narcissus humilis



Narcissus broussonetii

Photos: Michael Salmon

and 20 varieties distributed from Morocco to Egypt. The greatest concentration is, again, in Morocco. *Scilla peruviana* [see cover photo] is particularly variable and some are very fine plants. They occur from the Mediterranean coast to the pre-Sahara from sea level to 2500m. *Scilla mauretanica* is the southern Moroccan form of *S. italica*, while *S. intermedia*, *S. fallax*, *S. obtusifolia* and *S. numidica* are variations of *Scilla autumnalis* with slender, many-flowered spikes of white, purplish mauve or pale blue, produced in autumn before the leaves. *Scilla verna* and *S. monophylla* flower in the spring with the leaves, the first with a rosette of narrow, fleshy leaves and the latter with a solitary, broad leaf. Both have a spike of attractive, blue flowers on stems to 10cm tall. *Scilla lingulata* is another spring flowering species with a small rosette of deep green, lance-shaped leaves and short, dense spikes of china blue flowers on 5-10cm stems. The flowers usually open from the top downwards. It is found from Morocco to Tunisia, where it is very common. Tunisia also has an odd variation on the foregoing in *Scilla villosa*, a slightly larger plant with leaves and bracts densely covered in short, silvery hairs. *Scilla aristidis* is distinct in preferring deeply shaded woodland on acid soil in Algeria and Tunisia. The 20cm stems, enclosed by a sheathing rosette of thin, pale green leaves, have a short spike of pale blue flowers. *Scilla latifolia* is a rare plant confined to cliff faces and rock pinnacles. It is truly saxatile, with large, scaly bulbs whose strong contractile roots anchor it to the smallest ledges. A large rosette of 5-7 glaucous, green, lanceolate leaves to 20cm long surround a stout spike reaching 40cm, which carries 100-150 tiny, starry, pale blue flowers. Strong plants often produce branched spikes.

Urginea, evolving in north Africa, has since spread far south and east to southern Africa and India. *Urginea maritima* has surrounded the Mediterranean and is a common sight in autumn when its 50-150cm, slender spikes of starry, white flowers stand out above the summer browned vegetation. The huge surface growing bulbs often form dense clumps. *Urginea undulata* is smaller and easier to flower in northern climates, having 25-35cm spikes of larger, spidery-petalled flowers of a curious, smokey pink color. The lovely rosettes of strap-shaped, strongly undulate, glaucous leaves which follow in the spring are worth growing for themselves. It is found in a variety of forms from Morocco to Tunisia. Smaller and more undulate leaved varieties occur in southern Spain, southern Italy and some of the islands. *Urginea fugax* is a much smaller plant rarely reaching 20cm, with a slender spike of campanulate flowers of pale pinkish-brown which open late in the evening and are faded by the following morning. These are fol-

lowed by a few slender, deep green leaves in spring.

Dipcadi, besides being represented by *D. serotinum*, also has a superb salmon coloured variation in *D. lividum* and a much larger subspecies in *D. lividum* ssp. *fulvum*, which is autumn flowering and reaches 80cm in height.

Colchicum is represented by five species, none of which is endemic, and several subspecies which are. The finest is the autumn flowering *C. lusitanicum* subsp. *algeriense*, which has 10-15cm tall bunches of slender, pale or darker pink goblets, the petals variously netted or checkered with a darker shade. It is found in waste places and scrub from sea level to 2000m and from Tunisia to Morocco. *Colchicum neapolitanum* ssp. *micranthum* is found at high altitudes in Morocco, Algeria and Tunisia. The 2-3cm diameter, pale pink, solid, little flowers are held on very short tubes in late autumn. The small rosette of oblong leaves follows in spring. *Colchicum cupanii* is wide-spread around the Mediterranean. Those found in Morocco are small flowered forms having 3-10, narrow petalled flowers which are accompanied by the narrow, channeled, emerging leaves. *Colchicum cupanii* var. *pulverulentum*, from Tunisia and Cyrenaica, has leaves densely felted with short, silvery hairs. *Colchicum ritchii* from Tripoli and Cyrenaica spreads east to Egypt and eastern Mediterranean countries. It is a larger version of *C. cupanii* with 3-5 goblet shaped flowers of whitish or rose tint, sitting in a rosette of slender, lance shaped leaves in late winter to early spring. *Colchicum triphyllum* is another high altitude, spring flowering species with attractive pink, dark anthered flowers, 1-3 of which emerge from a sheaf of three more-or-less upright, dark green leaves in late winter to early spring. It is found on all the high mountains from Tunisia through to Morocco, where it reaches 3900m in the High Atlas.

Closely related to the foregoing is *Androcymbium*, which has a few odd members scattered around the Mediterranean but which is much more common in southern Africa. *Androcymbium gramineum* is a variable plant with several forms in Tunisia, Cyrenaica, Algeria and Morocco. It grows in seasonally wet, sandy, gravel hollows, usually within sight of the sea and has 1-7 small, white, cup-shaped flowers which sit upon a rosette of slender, prostrate leaves. The petals are sometimes marked with purple lines at the base. A more attractive pale rose variety, *A. saharense*, occurs in desert sands and that is where it prefers to stay.

Asphodelus acaulis is perhaps the best of this genus. It makes a splendid pan plant in poor, gritty soil to confine the octopus-like roots. Slender, succulent, prostrate leaves in a rosette produce in

succession a number of 5cm diameter, pure pink trumpets with golden anthers. The Moroccan and Algerian plants are strong growers, while the Tunisian is smaller and more delicate. All prefer limestone soils at high altitudes.

Iridaceae is represented by *Crocus*, *Iris* and *Gynandiris*. This last is widespread all around the Mediterranean and even further afield, usually in variations of blue, with or without a paler "eye". This form of *Gynandiris* appears throughout the area, but in Morocco a much superior variety is found, "*purpureoviolacea*", with large flowers of reddish-purple having variously coloured "eyes". Of *Iris*, the section *Xiphium* is represented by *I. tingitana*, *I. serotina*, *I. juncea* and *I. filifolia*. They all have ovoid bulbs with chestnut coloured tunics and a slender sheaf of arching, canaliculate leaves clasping the 18-45cm stems. These are topped by large, inflated spathes from which come one or two large flowers with slender, upright standards and spreading style arms above large, pendant falls. *Iris tingitana* is a combination of blue and violet, *I. filifolia* is reddish-plum coloured, while *I. serotina* is purple, though in this case the standards are reduced to minute bristles. Finally, *Iris juncea* has golden orange flowers with particularly large, wide falls.

Iris planifolia is the only representative of the *Juno* section in the western Mediterranean and is found throughout this area and also in southern Spain, Portugal and Sicily. The forms from Morocco are very strong and easy to cultivate, whereas those from the north and east of its range are smaller and more temperamental. The one to several flowers are carried on long tubes above a short sheaf of channelled, imbricate leaves and these can be up to 10cm in diameter. They come in various shades of blue and purple or a combination of these, variously flecked and spotted a deeper shade and with a golden crest to each fall. Albinos occur occasionally. It grows in the foothills to quite high elevations, generally in heavy terra rossa in open situations.

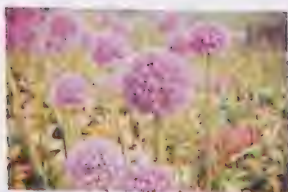
These notes have covered only a small portion of the monocots of north Africa; there are many others in the genera *Muscari*, *Gagea*, *Ornithogalum*, *Allium*, *Bellevalia*, *Tulipa*, *Fritillaria*, *Crocus*, *Anthericum*, *Asphodelus*, *Romulea* and *Narcissus*.



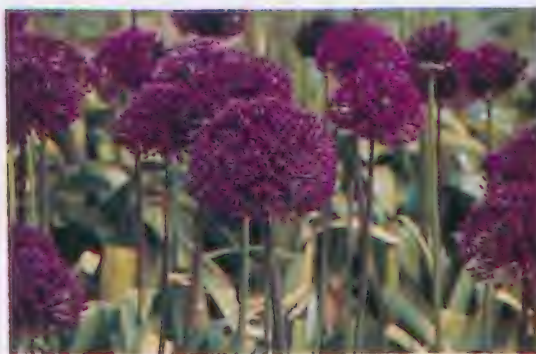
Allium aflatanense



Allium christophii



Allium maclearii



Allium Purple Sensation



Allium 'Globemaster'



Allium stipitatum 'Album'

Photos: Jan Bijl

ALLIUM — FLOWERING ONIONS

Jan R. Bijl
Limmen, Holland

It has been more than 40 years since I first saw the beautiful *Allium aflatunense* at van Tubergen's in Haarlem. Immediately I became enthusiastic about this new bulbous plant. Van Tubergen had imported this *Allium* species from the Pamir Alai Territory, Central Asia, the cradle of numerous beautiful and large decorative onions.

In my view the species *A. aflatunense*, because of the length of the stem and the keeping quality of the flowers, makes a quite suitable cut flower. I already knew a number of other species such as *A. christophii*, *A. macleanii* (*A. elatum*), *A. giganteum* and *A. stipitatum*, but all these missed what *A. aflatunense* had and therefore I tried to acquire as many bulbs of this species as possible.

In 1958 I bought my first bulbs and planted these up for seed production. This turned out to be a golden move because the summer of 1959 was beautiful and this combined with the fact that I also had bees yielded 8 kilograms of seeds. Every kilogram of seeds yields about 12,000 bulbs. In a few years, bulbs from the original seeds annually produced many kilograms of seeds.

In 1964, the fifth year after I had sown the first seeds, I already had 1 1/2 acres of bulbs in the field and the time had come to sell the bulbs which were ready for flowering. Because the species was still little known, it proved difficult in the beginning to find a buyer and after much effort an export company with sales in the U.S.A. was found that was willing to put money into it. People were very cautious in those days and something new meant taking a risk. Still, it proved possible to get an order for two years at a time for 250,000 bulbs yearly so that finally all expenses came back as a yield. Thus the love for alliums was bringing in hard cash and a stimulant to proceed.

During the flowering season in 1964, widespread in the production fields there were flowers with a very dark lilac colour that were much darker than the normal *A. aflatunense* and these made a great impact on me. Very carefully the bulbs of this new variety were dug up separately and collected.

In the following year they all came into flower again and it looked like this would be the beginning of an absolute topper. Much work would be needed to get it into production, for as was proved later, the seeds and the young bulbs were heterozygous so that a severe selection was needed for production of the seeds.

Each generation needs 4 to 5 years to blossom, so it is evident that a human lifespan is hardly long enough to get 100% real colours from seeds. Still I was successful in having the cultivar registered as *Allium* 'Purple Sensation', whereby the medium colour was taken as a standard.

The present techniques such as tissue culture and fast increase are also applied to 'Purple Sensation' but have produced poorer results. The cellular moisture of these alliums contains so many sugars that immediately upon bruising much goes amiss though this is not immediately evident. The risk of infections is very great and it was also proven that the bulbs are even filthy on the inside.

By sowing regularly and restricting the production of seed to a selected group of plants, it proved possible after some 10 years to deliver many thousands of bulbs for cut flower culture. Demand for the flowers was very great. Flowers were selected carefully as to colour when they were cut so as to be certain that the genuine plants were maintained for seed production.

Little by little the plants produced became more homozygous and it is no longer necessary to talk of a strain but of a cultivar. Now there are clones of 'Purple Sensation' that excel by their tremendous flowers and their deep lilac colour. It is, however, proved that the self-pollination inevitable with these clones results in fewer fertile seeds and does not contribute to a fast increase of the cultivar. Moreover, it is still a question whether the clones are sufficiently viable because there are indications that the vegetative increase diminishes little by little with the aging of the clone.

A rejuvenation through tissue culture is not so simple, as explained above. This requires more labour and still more patience to produce clones that can be grown on a profitable basis. A strict selection in the seed culture therefore will give better results, the more so because alliums from seeds grow exceptionally fast. Each year they increase in size and volume by 100% and mosaic virus in the young material is hardly a problem.

In the culture of cut flowers, attention should be given to the needs of the bulbs during dormancy. In tests in Southern Europe and also in the southern United States, uncooled bulbs cannot be planted. The bulbs react in the same way as tulips and are strongly influenced by the higher temperatures and light intensity. The flower stems in these areas stay very short and sometimes the flower buds will dry up if the bulbs have not been well adjusted. Apart from that, *Allium* 'Purple Sensation' is fit for a great number of climates because the bulbs can tolerate much frost so that a continental climate with a cold winter and a warm summer can be

well endured.

Allium aflatunense, and 'Purple Sensation' derived thereof behave like real continental growers with a fast and short growing time so that before the greatest heat of summer makes the plants die back, the bulbs will be entirely full grown. *Allium aflatunense* is found in the Aflatun region in the Tien Shan, a range of mountains in the southern part of Chinese Turkestan. The word 'tien' means heavenly and the word *shan* means mountain, thus Heavenly Mountain.

ALLIUM MACLEANII (A. ELATUM)

Another very beautiful allium is *A. macleanii*, which is in plant shape and growth somewhat similar to *A. giganteum*. This *Allium* is imported by van Tubergen from the Pamir Alai Territory of Central Asia. This *Allium* feels well at home in the western European climate and has large, oval, green, glowing leaves and pink-lilac flowers on stems of 3 feet [1m] high. The multiplication of this species is via seeds and vegetatively the bulb splits into two or three new bulbs which are all identical to the mother bulb. There are 16 chromosomes so that it is quite possible to cross with many other alliums also having 16 chromosomes. Although the median temperature in Holland is just a bit too low to produce seeds every year, after a beautiful summer seed has been produced after pollination by bees.

After sowing and 6 years of patience, the first flowers appeared and exhibited remarkable differences from the original stock of *Allium macleanii*. It was evident that the bees had made a cross-pollination between *A. macleanii* and *A. aflatunense*, with the latter as the male parent. These hybrids were selected and named and are registered by Mr. Hey as 'Lucy Ball', 'Gladiator' and 'Rien Poortvliet'. All of them are excellent cut flowers and are long lasting. From *A. aflatunense* they have derived leaves which are soon senesced, like many other alliums do. The multiplication of these cultivars goes very slowly because the flowers produce no seeds and the vegetative growth varies between 25% and 50% increase. No overproduction of these varieties is to be expected.

Because I, as a beekeeper, knew how usefully bees can take care of proper pollination of flowers, I had in 1958 a number of *Allium* species planted close together in order to find out if any new varieties could be produced. As I have indicated before, the summer of 1959 was very favourable so that especially from *Allium macleanii* I harvested many good seeds that could be sown in autumn. *Allium* seeds retain their germination power for one season and high temperatures in summer increase their quality.

In the summer of 1964 the first young bulbs came into bloom and right away a number of flowers stood out by their enormous size. It was not difficult to trace this as a crossing of *A. maclearii* and *A. christophii* because of the large size of the flower heads, leaves and stems. In contrast with many other alliums, the leaves were much greener and the flowering time lasted nearly a month. One of these jumbos, being the most beautiful and growing the best, I called 'Globemaster'. In every way this was a topper. The male parent, *Allium christophii*, was responsible for the large diameter of the flower head and the durability, so that this variety is excellent for use as a dried flower. The leaf also has the good quality of remaining green much longer than many alliums, thus increasing its usefulness as a garden plant. The female parent, *Allium maclearii*, added the high stem, the dark green glossy leaf and the enormous number of flowers. When counting the florets in one flower head I arrived at 1,100! It is noteworthy that the florets appear in succession so that the old flowers are regularly covered by the new ones. This means that the globe form enlarges but always appears fresh on the outside, making the decorative value much higher. If one spreads the newer, outermost florets apart the old and faded flowers become visible in the inside of the globe. The 'Globemaster' is also sterile, unfortunately, but this has the advantage of making the durability much greater. The stalk is strong enough to carry the large, heavy flower with ease, especially after a shower of rain.

In this case nature has achieved something very special by combining so many good qualities in one plant. Here a heterosis effect might be suspected. The growth is, in comparison with other alliums, fairly good, giving an increase of 50% to 75% yearly, so that competition with *Allium giganteum* can be foreseen. These flowers are already being exported to different countries, especially since their good keeping quality makes them very suitable for transport by air. It is tempting to tell more about this new variety but then it would no longer be an objective story.

It must be said, however, that *Allium maclearii* is particularly suitable for crossing with early as well as late varieties and very beautiful offspring will result. The 16 chromosomes make this possible as many of the large flowered alliums from Central Asia have the same chromosome number. For example, there is a cross between *Allium giganteum* (female parent) and *Allium christophii* (male parent) named 'John Dix'. This is also an excellent cut flower with a beautiful purple colour. It is hardly in cultivation any more, however, due to virus infection.

Another interesting crossing is of *Allium karataviense* with

Allium christophii. This hybrid has a large flower head on a very short stem with leaves the same colour as those of *A. karatawiense*. This variety is not yet available, and since the asexual multiplication is so slow, it will take several years before the bulbs become available.

By further study of the characteristics of some *Allium* species and also through the cultivation of a large number of bulbs, great differences came to light with respect to the susceptibility to various diseases. It is well known that the ordinary onion, *Allium cepa*, is very susceptible to head rot, *Botrytis aclada*. At the C.P.R.O.-D.L.O. Breeding Institute in Wageningen [Holland], it has been established that *Allium christophii* in particular has a large degree of resistance to this disease. For this reason extensive tests have been done at my nursery with crossings between these two *Allium* species. Here we have worked, not with bees, but with flies as a means of pollination. The researchers, however, had to come to the conclusion that the gap between the ordinary onion and the decorative onion was too great for any results to be reached. Maybe one day the goal will be reached through the manipulation of genes if tissue culture should succeed with alliums.

Another, and very important matter, is that many alliums suffer from *Sclerotium cepivorum*. At the nursery it was found that some varieties were very sensitive to this, such as *A. christophii*, *A. giganteum*, *A. flavum* and *A. oreophilum*. Less sensitive were *A. cowanii*, *A. sphaerocephalon* and *A. stipitatum*. This was again a reason for the Breeding Institute to make large-scale tests via soil infection in order to decide which varieties survived the disease. A strong pathogenic mixture was let loose on a representative collection of *Allium* species and varieties — and a true battlefield was the result. However, the varieties considered by me to be resistant remained completely unaffected. For scientists this was a welcome addition to the list of resistant varieties.

There are also differences in sensitivity with infection by eelworm (nematodes) and it would seem that especially the smaller varieties are the most susceptible, in particular *Allium coeruleum*, *A. oreophilum* and *A. moly*. Fortunately most of the more susceptible small varieties react well to warm water treatment so that here we have no problem with eelworm. This is not the case with the large flowered varieties, and here treatment must be given with the greatest of care in order to avoid damage.

Infection by the onion fly, *Delia antiqua*, is closely connected to the typical onion smell which the plants do or do not produce. *Allium moly* is a regular victim of these gluttonous fly larvae although their preference is for the American *Allium unifolium*.

which does not make bulbs but is one of the few alliums that produces tubers. The grower who forgets the fight against flies is left with absolutely nothing.

During the time that I, as a flower bulb grower, was very active in the sowing and cultivation of *Allium* species, it was always a new challenge to see what variation Mother Nature would produce. When a young lot of seed came into flower for the first time there was, at a distance, hardly any difference in form and colour to be seen, but on closer inspection there were very many small differences in nuance. Therefore it was interesting to see in which direction the color differences would go and eventually to make selections as I have already mentioned. With *Allium aflatunense* the colors ranged from dull white to deep purple. With *Allium maclearii* the color difference was less and went from lilac-pink to bluish purple, which is the color most desired. *Allium giganteum* gave colors from bluish violet to pink and can also go on to white as is the case with *Allium stipitatum*.

The long juvenile period of almost 6 years is to the disadvantage of the breeder and the increase of hybrids will therefore take some time. The cut flower market and particularly the flower growers demand large amounts of the same color so that a lot of work must be done by the breeders in order to arrive at good results and to produce reliable and similar lots.

CONCLUSIONS

- From Central Asia have come a number of attractive *Allium* species which have large flower heads and which are cold hardy and at the same time can withstand high temperatures.
- Many of these alliums possess a chromosome number of $2n=16$, so that they are easily hybridized. The foremost place is taken here by *Allium maclearii*. Some four hybrids involving this species have been registered in the Netherlands.
- All *Allium* hybrids are sterile so only asexual multiplication is possible. They flower for a long time due to their inability to produce seeds.
- There are great relative differences in resistance to a few well-known onion diseases, so that science, it is hoped, will be able to make use of this genetic diversity via new techniques.
- *Allium* flowers produce much nectar so that bees can be used for cross pollination.
- It is extremely important to maintain collections of *Allium* species in different places in the world in order to prevent the species from becoming extinct.

BULB CULTIVATION IN HONG KONG

Dennis Tsang
Hong Kong

My interest in flower bulbs began when I was in junior high school. My father used to take me to a friend of his who owned a little florist shop in hustle-bustle Kowloon. I was, and still am, fascinated by the beautiful flowers of the ever-popular hyacinth, crocus, tulip, anemone and freesia, to name a few.

Considering its climate, some gardening friends of mine thought that bulbs could never survive in Hong Kong. This hilly Territory experiences the sub-tropical monsoon climate where frost is rare, and happens only once or twice about every 5 years. The lowest temperature I can recall was -5°C recorded in 1992 on top of Tai Mo Shan, the highest mountain in the Territory, at an elevation of about 960m. Light frost is common on high grounds during winter. In urban and coastal areas, the minimum temperature can be as low as 1°C . We have never had snow in Hong Kong. Our winter is occasionally described as "quite Mediterranean" because of the frontal rains we receive during that time. Most winter growing bulbs begin their growth cycle here in late October. Frontal rains, which are usually associated with gusty winds, take place mainly in December and January in the form of light drizzles which may last for a week or so. Springtime begins from February through to April when the climate is influenced by both the unstable low pressure centred in Yunnan in southwestern China and the high pressure ridge extending from Mongolia and northern China. The typical springtime weather is characterised by a spell of warm (up to about 25°C) hazy days followed by a few days of about 15°C . These three springtime months are mostly overcast, misty, drizzly or rainy. Winter growing bulbs must not be given any additional water during this time and should be either lifted from the soil if planted outdoors, or covered by shelters to avoid excessive water. Certain genera such as *Gethyllis*, *Hessea* and *Strumaria* from the arid regions of South Africa are sensitive to moisture and may require special treatment to avoid fungal attack leading to fatal results. I grow some of these species in my office against the windows where they enjoy maximum light and the much needed low temperature and good air ventilation. My *Gethyllis* would never survive our climate if they were cultivated outdoors.

While the winter growers are dying back towards late spring, the summer growers begin to emerge. Most of the summer grow-

ers enjoy our long, hot and sticky summer when the temperature can be as high as 33°C, at a relative humidity of 100%! The high humidity is often disastrous to the winter growers. Even though water is completely withheld during summer, the dormant bulbs are badly affected by the high humidity.

I grow my bulbs in pots. Species which are sensitive to moisture are grown in deep, clay pots. Sharp drainage is provided by using mixtures of sand, vermiculite, pebbles and compost, depending on the species. Generally speaking, I use a mixture of more coarse sand and pebbles for bulbs which are sensitive to moisture. For those species which can withstand moisture throughout the year, sharp drainage is not so much a crucial matter, as these species enjoy a higher content of compost and less sand. Species of forest or aquatic origins are provided with rich humus in the growing medium and are preferably cultivated in deep, plastic pots. Water is also given throughout the year.

Following is a list of some of the amaryllids which have successfully acclimatised and grow well in Hong Kong.

<i>Ammocharis</i> :	<i>coranica, nerinoides</i>
<i>Boophane</i> :	<i>disticha</i>
<i>Brunsvigia</i> :	<i>appendiculata, bosmaniae, litoralis, natalensis, orientalis, radula, striata</i>
<i>Calostemma</i> :	<i>luteum, purpureum</i>
<i>Clivia</i> :	<i>caulescens, gardenii, miniata, nobilis</i>
<i>Crinum</i> :	<i>baumii, bulbispermum, campanulatum, macowanii, moorei</i>
<i>Cyrtanthus</i> :	<i>elatus, eucallus, labiatus, mackenii, sanguineus, staadensis</i>
<i>Eucharis</i> :	<i>grandiflora</i>
<i>Gethyllis</i> :	<i>sp.*</i>
<i>Haemanthus</i> :	<i>albiflos, barkerae, carneus, coccineus, deformis, humilis ssp. hirsutus, humilis ssp. humilis, pubescens, sanguineus, unifolius</i>
<i>Hessea</i> :	<i>chaplinii, stellaris, tenella, zeyheri</i>
<i>Hippeastrum</i> :	<i>advenum, blossfeldiae, lapacense, papilio, pardinum, puniceum, reticulatum var. striatifolium, rutilum var. fulgidum</i>
<i>Lycoris</i> :	<i>aurea</i>
<i>Nerine</i> :	<i>angulata, duparquetiana, filamentosa, huttoniae, krigei, undulata</i>
<i>Phaedranassa</i> :	<i>chloracra, cinerea, dubia, viridiflora</i>
<i>Scadoxus</i> :	<i>multiflorus, puniceus</i>
<i>Strumaria</i> :	<i>rubella, truncata</i>
<i>Urceolina</i> :	<i>peruviana</i>
<i>Worsleya</i> :	<i>rayneri</i>
<i>Zephyranthes</i> :	<i>candida, grandiflora, rosea</i>

* *Gethyllis* survive only if they are grown in an area where controlled humidity and temperature are provided.

On the other hand, a number of species which I have cultivated do not grow well in our climate. These include the following.

<i>Boöphane</i> :	<i>flava, guttata</i>
<i>Brunsvigia</i> :	<i>gregaria</i>
<i>Cybistetes</i> :	<i>longifolia</i>
<i>Cyrtanthus</i> :	<i>falcatus, galpinii, herrei, montanus, smithiae, obliquus</i>
<i>Haemanthus</i> :	<i>crispus, graniticus, montanus</i>
<i>Hessea</i> :	<i>unguiculata</i>
<i>Hippeastrum</i> :	<i>organense</i>
<i>Nerine</i> :	<i>bowdenii, laticoma, platypetala, sarniensis</i>
<i>Sprekelia</i> :	<i>formosissima</i>
<i>Strumaria</i> :	<i>watermeyeri</i>
<i>Vagaria</i> :	<i>parviflora</i>

While a small number of these species simply cannot survive our climate, bulbs of most species on this second list tend to exhibit a chronic shrinkage. However, most of these species grow well in my office where the temperature and humidity are kept at a suitable level.

My main interest is bulbs of the family Amaryllidaceae but I also grow bulbs of other families, including *Babiana*, *Dietes*, *Geissorhiza*, *Gladiolus*, *Iris*, *Ixia*, *Lachenalia*, *Lilium*, *Polyxena* and *Tulbaghia*. Most tender and half hardy species of the Iridaceae family grow well in this climate but they are prone to various pests, in particular red spider mites and aphids. Tender species of the Liliaceae and Hyacinthaceae also grow well in Hong Kong but they must be kept out of excessive moisture to avoid bulb rot. Their main pests are aphids and cockroaches which feast on bulbs of the genera *Eucomis*, *Lachenalia* and *Lilium*. Bulbs of the Amaryllidaceae are not without pests. For instance, *Cyrtanthus* (e.g. *C. elatus*), *Hippeastrum*, *Phaedranassa* and *Zephyranthes* are often infested with mealy bugs. *Ammocharis*, *Boophane*, *Crinum*, *Cyrtanthus* (e.g. *C. mackenii*) and *Nerine* are sometimes infested with red spider mites. Lily borer is not a major problem but occasionally caterpillars attack young leaves of *Ammocharis* and *Hippeastrum*.

Some bulbs are cultivated in Hong Kong for commercial purposes. *Clivia miniata* var. *miniata*, often misbelieved to be a Chinese species and mistakenly labelled "Chinese Orchid", is widely cultivated in this Territory, Taiwan and China. An incident of bribery took place about 20 years ago when a Taiwanese official received millions of dollars worth of *Clivia* plants from a merchant in return for securing a business contract. *Narcissus tazetta*, commonly thought by the Chinese to be a transformation of the Water

Goddess and hence the Chinese common name "Shui Sian", is grown in southern China for the fragrance of the flowers. They are cultivated in bowls filled with pebbles and water for the Chinese New Year. Gladiolus hybrids are grown in Hong Kong for cut flowers. For Chinese New Year and birthday celebrations, only red, orange and pink gladiolus flowers are used. White gladiolus flowers are used only for funerals.

Other species, such as *Eucharis grandiflora*, *Hippeastrum reticulatum* var. *striatifolium*, *Hymenocallis americana*, *Lycoris aurea* and, to a lesser extent, *Scadoxus multiflorus* are commonly used for landscaping and pot cultivation. These species are generally pest free and enjoy our climate. In one spot in the Po Lin Monastery (site of the largest outdoor Buddha statue in Asia), a lot of *Hippeastrum advenum* are grown and give a remarkable display in April.

Despite the extensive use of bulbs in this Territory, people's knowledge of their biology and cultivation is limited. *Clivia* is often, if not always, treated as an orchid. Considering the succulent leaves and thick bulbs, *Haemanthus* are grown by members of the Hong Kong Cacti and Succulents Society. Some people even regard it as a cactus.

We do not have a bulb society or any organisations to promote the cultivation of bulbs in Hong Kong. I am aware of only one bulb book in Chinese written by a Taiwanese grower. Obviously, something must be done to encourage the cultivation of bulbs.

Hong Kong imports a large quantity of plant material every year to satisfy the domestic demand. Our bulbs are mainly imported from the Netherlands and Japan. Major crops include plants in the genera *Anemone*, *Crocus*, *Freesia*, *Gladiolus*, *Hyacinthus*, *Iris*, *Narcissus* and *Tulipa*. With the exception of the more tender genera such as *Freesia*, *Gladiolus* and *Hyacinthus*, most imported bulbs do not survive our climate. In recent years, New Zealand, Taiwan and Malaysia have also been importing cut flowers of several species, particularly of *Allium*, *Lycoris*, *Nerine*, *Ornithogalum*, *Polianthes*, *Sandersonia*, *Zantedeschia* and a wide range of *Lilium* hybrids. Price and quality of imported material vary remarkably. Generally speaking, bulbs imported from Taiwan are cheaper than Dutch and Japanese bulbs but their quality is not always good. Japanese bulbs are usually the most expensive because buyers share the costs involved in the breeding programmes, extensive scientific research, high labour and excessive rental for the nurseries and storage. It is therefore not surprising that a Japanese hybrid *Clivia* may cost over 100 U.S. dollars. A pot of 4 seedling yellow *Clivia* plants was sold in 1993 for over

3,600 U.S. dollars! The unrealistic prices make the Japanese bulbs less competitive in our market. On the contrary, the Dutch are still enjoying a predominant share of the bulb market in Hong Kong for the reasonable prices and excellent quality of bulbs.

I obtain my bulbs through various channels. Specialty bulb nurseries in the U.K., the U.S., South Africa, Chile and New Zealand carry an extensive range of species, some of which are rare and should not be collected in their natural habitats. By joining various bulb societies, one can always get the chance to obtain rare and unusual species through the annual seed distribution. Members may also exchange bulbs among themselves and this has become one of my major sources of bulb supply. I also find the bulb journals and newsletters most useful to improve my technique in bulb cultivation.

My interest in bulbs has taken me twice to the Republic of South Africa. My visits to that country have opened my eyes. The encounters with bulbs in their habitats were not just exciting, but more importantly, gave a full picture of how a species adapts to its natural environment. The botanic gardens in South Africa are beautifully designed and most of them have a large collection of bulbs. The Kirstenbosch Botanic Garden in Cape Town is amongst the largest in South Africa. It carries some of the world's rarest and most unusual bulbs. The Karoo Botanic Garden in Worcester, south-western Cape Province also grows a wide range of bulbs from the Richtersveld, Namaqualand, southwestern Cape and the Karoo. Staffs of these botanic gardens are friendly and are helpful in answering any enquiries on bulbs. Spare bulbs are also available for sale at a nominal cost in the botanic gardens.

Several bulb species are native to Hong Kong. *Crinum asiaticum* produces broad, wavy leaves and white, spidery flowers in summer and grows in river mouths on muddy flats and coastal sand dunes. This species is widely used for landscaping purposes. *Lilium brownii* var. *australe* is a close relative of *Lilium formosanum* and produces about 4 white trumpets up to 8 inches long in summer. This species grows on hill slopes from sea level to an elevation of about 400m. *Iris speculatrix* is considered a rare species which is endemic to Mt. Violet on Hong Kong Island and a small number of areas in Guangdong, China. The species grows among bamboo thickets and flowers in late spring. *Scilla scilloides* grows on the southern flank of Pyramid Hill to the northwest of Sai Kung township (northeast Hong Kong), on a steep hill slope over 500m elevation. The species grows in a small colony in sunny, exposed locations among rock outcrops and coarse grasses. Bulbs are deep seated in soil pockets or occasionally are wedged in rock

crevices. Distribution of the species seems to be quite widespread as it is also found in Japan and China. In Hong Kong, however, it is not so common. *Scilla scilloides* bulbs are used in Hong Kong and China for easing joint pains, traumatic injury, toothache and cardiac edema, and prescribed for external use in carbuncles, mastitis and snake bites. This species produces racemes of pinkish-mauve flowers between July and September.

ERRATA

The following are corrections for HERBERTIA Vol. 49, 1993, A Review of the Genus *Nothoscordum* in Cultivation.

Page 15, the paragraph *N. andalgense* Rav. should read: *N. andalgense* Rav. (Catamarca Province, Argentina). A new species, little is known of it, but flowers are white and somewhat similar to *N. arenarium*. End of paragraph. *N. andicolum* Knuth, beginning at the end of the second sentence of the same paragraph should begin another paragraph as a separate and distinct species.

Page 19, the photo caption top left should read: *N. bivalve* var. *lilacinum*; the photo caption lower left should read *Nothoscordum bivalve* var. *lilacinum*, lilac colored form.

GLADIOLUS IN TROPICAL AFRICA

This new book by Dr. Peter Goldblatt of the Missouri Botanical Garden is in the final prepublication process. The book will deal with all 82 tropical African *Gladiolus* species, 26 of which are newly described. The book will be extensively illustrated with color photographs, drawings and distribution maps.

To help subsidize printing costs and allow the book to be sold at a reasonable price, a special offer is being made. For a donation of \$500.00 from corporations or \$250.00 from individuals, donors will be acknowledged in the book and receive an author-signed copy. Your donations must be received by September 1 to have your name or corporation acknowledged in the book.

Donations should be payable to the Missouri Botanical Garden and mailed to Dr. Peter Goldblatt, Missouri Botanical Garden, P.O. Box 299, St Louis MO 63166-0299, United States of America.

**CYBISTETES LONGIFOLIA AND THE
AMARYLLIDACEAE OF FERRARI IN 1633 A.D., ROME**

L.S. Hannibal

Fair Oaks, California, United States Of America

Several years back the existence of the Roman *FLORVM CVLTVRA* of 1633, edited by G.B. Ferrarii (1584-1655) came to our attention. Since the publication reportedly contained information on several *Amaryllis belladonna* forms, a set of photocopies covering these plates and the text was obtained. It was found that the Ferrarii publication consisted of some 500 pages covering the descriptions and culture of some 400 various garden plants. Two full chapters were devoted to the *Narcissorum* (Amaryllidaceae), covering mostly Mediterranean species, but five South African Cape Province species were included and several were illustrated. Since the information covered predates Linnaeus by more than 100 years and is of particular historical importance, it is hoped that the Amaryllidaceae sections can be translated from their provincial Roman-Latin and be published. However, certain specific information has been uncovered which makes it desirable that some findings be published independent of the translation. Considerable botanical activity was taking place in the Mediterranean area during Ferrarii's time which history has quite ignored in preference to the activities under way in Northern European botanical centers.

For example, there was a large medicinal herbal garden in Rome where many flowering plant imports were propagated in collaboration with Jacobian monks. Concurrently, Ferrarii was a senior member of a recognized horticultural association which was affiliated with these activities. His *FLORVM CVLTVRA* was more than a botanical treatise. It was actually a "cyclopedia of horticulture" which took up gardening, gardening practices, the pleasure and appreciation of fine gardens as well as descriptions of various plants and how best to grow them. It was quite modern in its arrangement.

Movable type had been in use for a century or more, but copper plate etchings were relatively new and Ferrarii used a number of such plates to enhance his publication. These etchings were of excellent quality and those of botanical specimens prepared by Anna Variana are the equivalent in accuracy to modern work, as is obvious from the plates presented. Thus, Ferrarii's publication represents a deluxe edition entailing considerable organization and preparation of text. Binomial nomenclature was used in many instances and this is a surprise since its use was not accepted in northern Europe for over a century afterwards. Species of *Rosa*, *Lilium*, *Iris*, *Anemone* and *Hyacinthus* were so identified.

It was only 130 years previous that the Cape of Good Hope

coastal area had been explored by Vasco de Gama (1496-1502) while opening up the route to India. While there, he took precise astrolabe sightings for latitude near the Berg River at St. Helena Bay 150 miles north of the Cape. Whether he or subsequent Indian trade ships picked up bulbs while taking on fresh water there is not known, but numerous ship captains knew of the Jacobian monks' interest in plants which might have possible medicinal benefits or attractive blossoms. Consequently bulb material which could survive long trips was often dug and brought back to the Jacobians at Rome. Table Bay was not used by the Dutch until 1650.

Thus bulbs from this area had been grown for some years in the Roman *Farnesiorum* gardens. The plants' habits and cultural needs were well known to the monks, but not to the gardening public. Ferrarii, therefore, described the bulbs and their culture in detail using lengthy, Latinized descriptive names for clarity.

His first bulb is described as *Narcissus virginiensis flore purpurascens* which appears to be a *Vallota* or *Cyrtanthus*. A second by name is *Narcissus indicus flore liliaceo sphericum*, which from the plate is obviously *Brunsvigia orientalis*. Another is *Narcissus indicus puniceus germino latore folia* which is obviously *Haemanthus coccineus*. The correct identification of this plant as a *Narcissus* (Amaryllidaceae) speaks well for the botanical capabilities of the monks or Ferrarii.

However, plates 121 and 119 are our main concern. Plate 121 is *Narcissus indicus diluto colore purpurascens* and is distinctly a pale lavender *Amaryllis belladonna* type with a radial umbel quite representative of the *A. blanda* of Ker-Gawler (see Bot. Mag. t. 1450). Such radial umbel forms are found near Hermanus some 75 miles east of the Cape. There is no question over identity, but Plate 119, *Narcissus indicus liliaceus saturo colore purpurascens* is also described as *N. indicus è rubro croccus flore liliaceo* in the cultural text, which indicates that the blossoms open a pale blush pink-saffron and progressively turn red. The description also states 20 blossoms of lily shape (meaning *Lilium candidum* shape) equally distributed on a stocky scape two hand-widths high.

Many individuals have assumed this etching was merely another form of *A. belladonna*, but there are too many dissimilar features indicated in the etching, and mentioned in the descriptive text, to justify this plant being an *A. belladonna*. And Anna Variana's capability as a botanical artist on other plants would not justify her turning out an imperfect illustration. A literature search of plant descriptions finally disclosed that it was *Cybistetes longifolia* by using the Milne-Redhead and Schweickerdt report (1939), but Plate 119 required cross checking with several other floral plates of *Cybistetes* for final validation since the lectotype drawing in *PARADISUS BATAVUS* is somewhat misleading floral-wise. The *Cybistetes* is cited as common about the Berg River flats

where Vasco de Gama made his astronomical-latitude surveys while mapping the coastal area north of the Cape. Thus it is possible that bulbs were collected by the monk on that expedition or by someone later, but there was an apparent quantity grown for some years in Rome by the Jacobians at the *Farmifolium*. These were in cultivation when Ferrarii described them.

However, this is only the start of the story. Jacques Barrelier, a Dominican monk, copied two of Ferrarii's etchings, plates 119 and 121, in reverse. Barrelier's descriptive text was lost in a fire, but the plates were eventually published posthumously as Plates 1039 and 1040, respectively (Barrelier, 1714). The name used for each was *Lilio Narcissus Indicus* with sub-descriptions of flower colors. So it is obvious that Barrelier was not aware that Ferrarii's plate 119 was a *Cybistetes*, and thus, quite distinct from the plant depicted in Plate 121, which was known provincially in Rome as "Donna Bella". It also appears that no one since has recognized, at least not in print, the true identity of the Barrelier Plate 1039: that it was a *Cybistetes*. Thus when Dr. Traub happened on the Barrelier copy he assumed from the color description that it was *Amaryllis belladonna* and particularly the variant *purpurea major* commonly called 'Major' in California gardens. He further cited plate 1039 as lectotype for this variant, naming it *Brunsvigia* 'Major' (PLANT LIFE 1983). Obviously it cannot be a lectotype for anything other than *Cybistetes longifolia* and the Ferrarii original plate is far more accurately drawn for such.

But Dr. Traub seemingly overlooked another detail in his nomenclatural activities: a basic edict which Linnaeus promulgated in his various editions of *GENERA PLANTARUM* dating from 1737 on, that members of the genus *Amaryllis* specifically have trifid stigmas to be so classified, and that those with capitate stigmas are in the genus *Crinum*! Since this Linnaean edict was issued in 1737, the same year that *HORTUS CLIFFORTIANUS* was published, his *A. belladonna* therein was obviously trifid, and this eliminates both *Hippeastrum puniceum* and *H. reginae* from Linnaeus' genus *Amaryllis*, as both have capitate stigmas. So Linnaeus must not have seen or examined a *Hippeastrum* while at Cliffords in Holland, nor had he been aware of their capitate stigmas until he examined a plant when Jacobus Alm was preparing his doctorate dissertation on *PLANTAE SURINAMENSES* in 1775. This explains why Linnaeus had labeled a specimen of *Hippeastrum barbatum* in his herbarium as *Crinum barbatum*. It also explains his calling *H. puniceum* an *Amaryllid dubia* in his and Alm's *AMOENITATES ACADEMICAЕ* publication on Surinam plants. Indirectly, it suggests that he had definitely removed *Hippeastrum* from the genus *Amaryllis* since by his *GENERA PLANTARUM* edict a *Hippeastrum* would be a *Crinum*, the same as he treated *Cyrtanthus*.

Thus it is rather obvious that the Cape *Amaryllis belladonna* specimen from Cliffords collection in the Linnaean Herbarium was

the plant that Linnaeus had examined, probably mounted and was naming, and that it had a trifid stigma — but some botanists may protest and note that *A. belladonna* has a capitate stigma — some do. The fact is that either form may occur in the species; it depends upon the ecovariant examined and the area from which it came. Most variants from the north coastal areas and inland Cape Province which the writer has under cultivation are trifid.

So, after 350 years we now know that they were growing *Cybistetes* as well as *A. belladonna* in Rome. Despite Ferrarii's careful cultural instructions on both pages 115 and 309, the *Cybistetes* probably proved too exacting in their cultural requirements to survive permanently in Rome, but the radially umbellate bland "Donna Bellas" (*A. belladonna*) may still be in some gardens. We note that Hermann identified a *Cybistetes longifolia* as *Crinum longifolia* and pinned the name "Donna Bella" onto *Hippeastrum puniceum*. Either he missed Ferrarii's description of *Narcissus indicus* è *rubro croccus, flore liliaceo*, or else like many Northern European botanists ignored Ferrarii's publication entirely. But, "twenty (Madonna) lily-like blossoms colored flesh-pink and saffron turning red and opening at near one time in a radial pattern on a sturdy scape a mere two hand-widths high" are specifically features of *Cybistetes longifolia*, and particularly so when drawn with the ovaries as "hardly distinguishable from the apex of the pedicels and the base of the tube".

A point to note is that *Cybistetes* are far more difficult to grow than *Amaryllis belladonna*. The Jacobian monks and church priests distributed both species widely about the Mediterranean due to their medicinal value as an antiseptic wash for cuts and ulcers, as well as their flowers which come in late fall when little else is in bloom in that area. So the hardier *A. belladonna* easily usurped the *Cybistetes*' "Donna Bella" provincial name and became a very popular church garden plant, even reaching the Chilean and Californian missions. It thrives on neglect in summer-dry locations.

In Holland, Clifford apparently obtained a common, small, red flowered *A. belladonna* variant from Portugal or the Madeira Islands where it had grown for 150 years or more. And here Linnaeus and Georg Ehret, his artist, encountered the plant by its provincial name "Donna Bella" or "Belladonna". Ehret's near unknown drawing of a Cape "Belladonna" made at Philip Miller's in London, labeled *Lilio narcissus americanus belladonna dictus* (Ehret, 1744) verifies their knowing the Cape bulb as "Belladonna" by its provincial name. Unfortunately, they assumed it conspecific with an American *Hippeastrum*, since the latter, *H. striatum*, with red pigmentation similar to the Linnaean specimen was illustrated as *Amaryllis* by Jacques le Moyne 1585 by copper etching in his LA CLEF DES CHAMPS.

Meanwhile, Linnaeus identified a *Cybistetes* from a mounted

specimen as *Crinum longifolium*, not relating it to the *Ferrarii* plate or other names given below.

Addenda: On further investigation it appears that *Cybistetes longifolia* was commonly imported into Europe as *Amaryllis belladonna* in pre-Linnaean days, one reason for this is that it was readily accessible about the Berg River Flats and the Cape Flats. In fact it was possibly hybridized, as there is such a report in Mund's FLORAL REGISTER, Ed. 1: p. 111, t-879, possibly in BOTANICAL REGISTER under t-1219, and similarly reported in the HORTICULTURAL MAGAZINE OF N.S.W. with a plate opposite page 65, 1866. The small size of the ovary and "Madonna Lily" shape of the blossoms is a telltale feature of *Cybistetes*. However, the pre-Linnaean names are the most interesting, as follows:

PRE-LINNAEAN NAMES

- Lilio-narcissus rubens indicus* Aldinus, HORTE FARNESIANO, Rome: 83, t-82, 1625.
Narcissus indicus è rubro croccus flore liliaceo Ferrarii, syn.
Narcissus indicus liliaceus saturo colore purpurascens Ferrarii, FLORVM CVLTURA, Rome: pp. 115, 309, t-119, 1633.
Narcissus pumilus indicus polyanthos Cornut. CANAD. PLANT. p. 153, t-57, 1635; Rudb. ELYS. p. 89, fig. 9, 1701.
Lilio-Narcissus indicus pumilus polyanthos Moris. HIST. PLII:368, 1680.
Lilium africanum humili longissimus foliis polyanthos saturate colore purpurascens Herm. HORT. ACAD. LUGD. -BAT.: 682, 1687; Herm. PARAD. BAT.: 195, t-195, 1698.
Lilio-Narcissus africanus platycaulis humilis flore purpurascens dorato Comm. HORT. AMST. I: 71, t-36, 1697; Rudb. ELYS.:180, fig. 8, 1701.
Lilio Narcissus africanus pumilus polyanthos Tourn. INST.:86, 1700; Boerh. IND. ALT. PL. II: 147, 1720.
Amaryllis spatha multiflora corollis companulatis aequalibus scapo compresso longitudine umbellae Royen FL. LEYD. PRODR. p.36, 1704

LINNAEAN AND POST LINNAEAN NAMES:

- Cybistetes longifolia* (Linn.) Milne-Redhead & Schweickhardt, 1939
 Syn. *Crinum longifolium* Linnaeus, 1753
Crinum falcatum Jacques, 1776
Amaryllis falcata (Jacq.) L'Heritier, 1788
Crinum longifolium (Linn.) Thunberg, 1794
Haemanthus falcatus (Jacq.) Thunberg, 1794
Brunsvigia falcata (Jacq.) Ker-Gawler, 1812
Ammocharis falcata (Jacq.) Herbert, 1821
Ammocharis longifolia (Linn.) Roemer., 1849
Brunsvigia multiflora Bidwill non Ker-Gawler, 1850
Amaryllis coranica var. *pallida* Burchell, 1936

REFERENCES

- Barrelier, J. (Edited by Jessieu, A.) 1714. PLANTAE PER GALLIAM,

- HISPANIAM ET ALIAM OBSERVATATE, Paris. t-1039, t-1040.
 Cape Province Administration, 1967. PROTECTED WILDFLOWERS OF
 THE CAPE PROVINCE, Cape Town. t-22, *Cybistetes longifolia*.
 Clifford, George. 1737. HORTUS CLIFFORTIANUS.
 Ehret, Georg D. 1744. Plate: *Lilio narcissus americanus bella-*
donna dictus, published in C.J. Trew's 1950 HORTUS NITIDIS-
SIMUS, t.18, under secondary erroneous name of *West Indische*
rathe Lilie.
 Ferrarii, G.B., 1633. FLORVM CVLTVRA, Rome. Booklet II, pp. 115-
 123; booklet III, pp. 309-310.
 Milne-Redhead, E. and Schweickerdt, H.G. 1939. The Genus
Ammocharis [and *Cybistetes*] in JOURNAL OF THE LINNAEAN
 Soc. LII; 191-197, t.4.
 Mund, ?, THE FLORAL REGISTER, Ed. 1, p. 111, t-879
 Traub, H.P. 1983. Lectotypification of *Amaryllis belladonna* (1753),
 PLANT LIFE 39: 16-34, with figures 1-A & 1-B; 18.



Cybistetes longifolia, a 20-flowered specimen. Plate 119 from Ferrarii's *Florvm Cultvra* of 1633, Rome, and described as *Narcissus indicus è rubro croccus, flore liliaceo* or the Jacobian Narcissus. Barrelier copied this plate as t-1039 naming it *Lilio narcissus indicus saturo colore purpurea, polyanthos*. He probably failed to differentiate it from *Amaryllis belladonna*.

BLETILLA STRIATA

Charles Hardman
Baldwin Park, California, United States of America

One of my favorite geophytes is the terrestrial orchid, *Bletilla striata*, sometimes called *Bletilla hyacinthina* or *Bletia hyacinthina*. Growing in my garden now for more than twenty years, this tough, hardy orchid never fails to reward me yearly with numerous tall sprays of richly hued, rosy fuchsia to rosy purple flowers exactly the "orchid" color of and similar in shape to its big cousins, the corsage *Cattleyas*.

A.W. Darnell, in his landmark book *ORCHIDS FOR THE OUTDOOR GARDEN*, first published in 1930 by L. Reeve & Co., Ltd., Ashford, Kent, England, published again in 1976 by Dover Publications, Inc., New York, NY, describes the root of *B. striata* as "a depressed tuber", the stem as "about 12 inches tall, slender, erect", the leaves as "basal...linear-lanceolate or lanceolate, about 9 inches long, the raceme as "4-6 inches long, of about 6 blossoms" and the "flowers about 1 1/2 inches across".

I have to wonder if Mr. Darnell was examining a dwarf or undernourished form of this pretty orchid. In my yard, its flower stems grow from 18 inches to 33 inches tall with the leaves topping off at about 30 inches. The racemes grow from 6 inches to 12 inches long, and they frequently bear up to 11 or even 12 blossoms which are, as Darnell states, about 1 1/2 inches across.

Mr Darnell goes on to say, "The plant is usually found in dry soil on the margins of thickets in China and Japan". Perhaps its love for dry soils is one of the reasons this gem grows and blooms so well in the area surrounding Los Angeles, California. Our area was wrested from the desert only a short geological moment ago, and it would return to its desert condition within a short time were it not for the extensive irrigation systems which keep our yards green — but sometimes only just green — year-round. Here, *B. striata* quickly forms thick clumps which, along with its tall stems, tall leaves and good flowering habits tells me that this living jewel is happy in its Southern California home away from home.

Darnell states that in its native habitats, *B. striata* "reaches its greatest elevation of 10,000 feet on the mountains of Western Yunnan". This surprising statement ("surprising" because we don't usually think of orchids as plants which endure being thrust 10,000 feet into the sky; sounds cold to me!) overshadows his next: "It is quite hardy in Great Britain in a sheltered half-shady spot in the rock garden in well drained loam and leafsoil". After

the rigors it must meet jutting into the clouds in some of its native habitats, its hardiness under conditions such as those found in British gardens is not quite so surprising. In my own garden, about 600 feet above sea level, its hardiness is not in question, even though the winter nighttime temperatures will sometimes drop below 20° F.

I have seen *B. striata* in old clumps of varying sizes in the terraced gardens of a mansion located on top of one of the Hollywood Hills just south of Griffith Park. The owner of this estate during the early 1960s was a friend of mine who told me that the mansion was built by a wealthy lumberman during the late 1920s when Hollywood was rich and wild, yet still maintained an "every-one-knows-everyone-else" village atmosphere. It may be hard to think of the current Hollywood as a once-upon-a-time cozy community (old-timers swear it was) but it's not so hard to think of a wealthy lumberman, newly married, sparing no expense in decorating and furnishing his new home for himself and his wife. I was told that many a party with many a Hollywood celebrity was held in that magnificent home.

In spite of the fact that the mansion itself was resplendent with wall and ceiling paintings decorating the rooms, gold leaf emblazoning some of the doors and paintings, ten bedrooms, a grand salon with a view plus expensive furniture and an atmosphere of opulence throughout, the gardens presented an entirely different picture. They looked as though the owner hadn't a clue what to do with them after the terracing was completed. It's true I was seeing the gardens more than three decades after their beginning. Still, one would have thought that even after thirty-plus years there would be more of interest in these gardens than just a path, a few herbaceous perennials, the hillside terracing, some starved-looking trees, and scattered pyracantha and camellia bushes which also looked starved.

And then there were those *Bletilla striata* clumps, many, many, clumps, scattered about the gardens, all looking starved themselves but blooming cheerily away, announcing to all who saw them that their small needs were being met with the air and sunshine, the poor soil and rainwater of their hilltop home. I told my friend, the estate's owner, that the pretty magenta flowers decorating his property were orchids. He laughed off this reality with "No, I don't think they're orchids. I think they're some kind of a bulb". I didn't press the point.

I spotted another splendid stand of *B. striata* several years later along the side of a yard in Temple City, California (about 20 miles east of the Hollywood clumps). I was walking along a street of that city when suddenly, there they were, hundreds and hundreds of plants, all growing in a thick profusion, tubers crowding

one another, some tubers partially protruding out of the soil.

At ground level, this massive clump was a mess. Above ground level, however, it was magnificent. These plants were far better cared for than their Hollywood relatives and there were flowers galore. What a sight! I shall never forget it.

In my own yard my *B. striata* clumps are modest by comparison. Yet they put on a splendid show every spring, egged on, no doubt, by adequate water and occasional fertilizer.

There are at least three forms of *B. striata* in Southern California, the type being the most common. In addition, *B. striata* var. *alba* has nearly white flowers with just a flush of lavender pink. This variety seems to be less vigorous than the type. The variety with white leaf edges which I received without a name (var. *albo-marginata*?) maintains both the fuchsia flowers of the type as well as its vigor. There may be other varieties and forms with which I am unfamiliar.

While the mother tubers of this orchid grow, bloom and increase with abandon and while I have seen many seed pods on my plants which yielded thousands, perhaps millions, of tiny seeds, I have never yet spotted a seedling. Probably the mycorrhizal fungus these orchid seeds may need in order to germinate and develop into plants is missing from my soil.

I recommend this easy, eye-catching plant to any geophytophile (bulb lover). It's a pleasure to grow and it's always fun to point it out to garden visitors by saying "Now here's an orchid I really like", and then watch their faces as they wrestle with whether or not I'm kidding them about *B. striata*'s being an orchid.

It is an orchid, though, and another of Nature's living jewels.

A SOURCE LIST OF GEOPHYTIC PLANT MATERIAL

Dave Casebier, 45 Priest Street, Hudson MA 01749
United States of America

This list is intended as a resource for members of the IBS and is in no way an endorsement of the businesses listed. Whereas I have had personal experience and/or correspondence with the majority of those suppliers listed, I cannot vouch for the reputations and/or reliability of all listed below. I was able to get a firm foothold on this list several years ago with the help of Barbara Barton's book **GARDENING BY MAIL: A SOURCEBOOK** and include it here as an initial reference.

It is intended that this list be updated and expanded yearly with the aid of members and suppliers who wish themselves to be known. Information on quality of service, time taken to receive orders, accuracy of naming and quality of products would be beneficial. Please send addresses and/or catalogs to Dave Casebier, at the above address. In particular there are few South American sources, and I would like to add more such sources which could be used by members.

SEEDS

B & T World Seeds

Whitnell House, Fiddington, Bridgwater, Somerset TA5 1JE England
David Sleigh Fax & Tel 0278 733209

Huge, very extensive lists of seed, organized by type (the first you will get is a list of lists: alpine, perennial, trees etc., ask for list number 6 (bulbs); will also try to fill requests.

Chiltern Seeds

Bortree Stile, Ulverston, Cumbria LA12 7PB England
Tel (01229) 581137 Fax (01229) 584549

Large seed supplier, lists some *Bomarea* and *Stenomesson* species and has had *Pamianthe peruviana* in the past.

John Watson and Anita Flores de Watson

24 Kingsway, Petts Woods, Orpington, Kent BR5 1PR England
Tel (0689) 822494

Wild collected alpine seed from South America, *Rhodophiala* sp.

Luis D. Arriagada G.

Casilla 8261, Viña de Mar, Chile
Tel 223-2287

Hippeastrum, *Rhodophiala*, *Placea*, *Phycella* species; Iridaceae and Liliaceae, all from Chile.

Martin Kunhardt

Wahroonga, P. O. Box 144, Merrivale 3291, Republic of South Africa
Seed of *Cyrtanthus*, *Brunsvigia*, *Watsonia* and High Veld bulbs, also
hybrid *Cyclamen* and *Streptocarpus* seed.

Monocot Nursery

'Jacklands', Jacklands Bridge, Tickenham, Clevedon,
Avon BS21 6SG England
M. R. Salmon

Extensive list of *Narcissus*, *Araceae*, *Colchicum*, *Puschkinia*, *Scilla* and
Crocus, as well as other dwarf bulbs. Collector number and locality sup-
plied with many of the offerings.

Silverhill Seeds

18 Silverhill Crescent, Kenilworth 7700, Republic of South Africa
Rachel and Rod Saunders Tel (021) 762-4245 Fax (021) 797-6609
Successor to Parsley's Cape Seeds. Large listing of S. African plants,
including extensive bulb section. Can obtain amaryllids at times.

BULBS

Amaryllis, Inc.

P. O. Box 318, Baton Rouge, LA 70821 U.S.A.
Ed Beckham Tel (504) 924-5560, (504) 924-5421
Mostly *Hippeastrum* hybrids, but some species of *Hippeastrum*,
Habranthus, *Lycoris* and other bulbs.

Anthony J. Skittone

1415 Eucalyptus, San Francisco, CA 94132, U.S.A.
Tel (415) 753-3332
Large list of South African bulbs and hybrids. Very good selection.

Avon Bulbs

Burnt House Farm, Mid Lambrook
South Petherton, Somerset TA13 5HE England
Chris Ireland-Jones Tel (0460) 242177
Wide-ranging list of hardy bulbs with both species and hybrids.

Broadleigh Gardens

Bar House, Bishop's Hull, Taunton, Somerset TA4 1AE England
Christine Skelmersdale Tel (0823) 286231
Specializes in dwarf bulbs: *Crocus*, *Fritillaria* species, tulips and iris,
hyacinths and daffodils as well as other dwarf rarities.

Cambridge Bulbs

40 Whittlesford Road, Newton, Cambridge CB2 5PH, England
Norman Stevens Tel (0223) 871760
Extensive list of hard-to-find, hardy, small bulb species, also offers
Tecophilaea cyanocrocus, *T. cyanocrocus leichtinii*, and *T. violacea*.

Cape Flora Nursery

P.O. Box 10556, Linton Grange, Port Elizabeth 6015, Republic of South Africa

Tel (041) 732096 Fax (041) 731081

Good list of amaryllids (including *Brunsvigia* and *Cyrtanthus*) and irids from the Cape.

David Sampson

Oakdene, Street End Lane, Broad Oak,
Heathfield, East Sussex, TN21 8TU England
Tel (0435) 864382

Primarily an alpine grower, but some *Lilium*, *Iris* and *Trillium* species.

Flowers and Greens

P. O. Box 1802, Davis, CA 95617, U.S.A.

Roy Sachs Tel. (916) 756-9238 Fax (916) 756-1201

A hobby gone out of control. Sells own alstroemeria hybrids in very unusual and nice color combinations, sometimes has warm-growing species for sale.

Grant Mitsch Novelty Daffodils

P. O. Box 218, Hubbard OR 97032, U.S.A.

Dick & Elise Havens Tel (503) 651-2742

The cutting edge in daffodil hybrids, still searching for the true red-on-white. These are luscious, exotic bulbs for those of us who live in the tundra.. Catalog is \$3.00 U.S.

Guy Wrinkle Exotic Plants

11610 Addison Street, North Hollywood CA 91601 U.S.A

Tel (818) 766-4820

Rare plants that are in short supply from the wild. I have seen his list and it is quite impressive. I believe, however, that most of his plants are collected in the wild.

Imbali Bulbs

P. O. Box 267, Auckland Park 2006, Republic of South Africa

Robert and Andrea Orr Fax 011-27-486-1527

Wonderful list of South African bulbs, both from the Iridaceae and Amaryllidaceae, good selection and reasonable prices.

Jacques Amand Ltd.

The Nurseries, Clamp Hill, Stanmore, Middlesex HA7 3JS England

Tel (981) 8138 Fax (981) 6784

Well known nursery for bulbs, somewhat pricey but has interesting and rare material, including *Tecophilaea cyanocrocus*, *T. cyanocrocus* var. *leichtinii*, and *T. violacea*. Now has an American supplier and 800 number, but the tack-ons, dollar-pound exchange, additional shipping and phytosanitary certificates can be expensive.

Jim Duggan Flower Nursery

1452 Santa Fe Drive, Encinitas CA 92024 U.S.A.

Tel (619) 943-1658

Primarily South African irids and some *Lachenalia* species. List varies somewhat from year to year. Now has the stock of BioQuest Int.

Kelly's Plant World

10266 E. Princeton, Sanger, CA 93657 U.S.A.

Herb Kelly, Jr. Tel (209) 294-7676

List is U.S. \$1. Sells a broad selection of canna and crinum hybrids, also has a large collection of choice lycoris hybrids.

Lousiana Nursery

Route 7, Box 43, Opelousas LA 70570 U.S.A.

Ken, Albert and Dalton Durio Tel (318) 948-3696 or 942-6404

Catalog is U.S. \$3, large listing of choice crinum hybrids and some rare bulbs which thrive in the southern U.S.

Lowlands Nursery

P. O. Box 9, Kei Road 4920, Republic of South Africa

Ms. Joan Bursey Tel (0432) 820731 or 820730 Fax (0432) 820731

Sells a number of cycads but also has a good number of bulbs for sale at low prices. My experience with her has been excellent.

McClure and Zimmerman

P.O. Box 368, Friesland, WI 53935, U.S.A.

Tel (414) 326-4220 Fax (414) 326-5769

Large list of choice bulbs, varying slightly from year to year.

Monocot Nursery

'Jacklands', Jacklands Bridge, Tickenham, Clevedon, Avon BS21 6SG England

M. R. Salmon

Extensive list of *Narcissus*, *Araceae*, *Colchicum*, *Puschkinia*, *Scilla* and *Crocus*, as well as other dwarf bulbs.

Paul Christian - Rare Bulbs

PO Box 468, Wrexham, Clwyd LL13 9XR United Kingdom

Species-oriented, extensive list of hardy bulbs; some more tropical species. Careful attention given to customers and names of the plants.

Summer list: £0.60, DM 1.50, FF 5.00; also a winter list.

Pine Heights Nursery

Pepper Street, Everton Hills, Queensland 4053, Australia

Tel (01617) 353-2761

Sells *Calostemma lutea* and *C. purpureae*, also *Sprekelia*, *Crinum*, *Habranthus*, *Zephyranthes*, *Hippeastrum*, other subtropical amaryllids.

Potterton and Martin

The Cottage Nursery, Moortown Road, Nettleton
Caistor, Lincolnshire LN7 6HX England
Tel and Fax (1472) 851792

An alpine grower with an extensive list of dwarf bulbs, both hardy and temperate.

Rust-en-Vrede

P.O. Box 753, Brackenfell 7560, Republic of South Africa
Hendrik van Zijl Tel (021) 742574 Fax (021) 981-0050
Established, reliable supplier of South African bulbs and seeds.
Extensive list from a wide range.

Russell Graham, Purveyor of Plants

4030 Eagle Crest Road N. W., Salem OR 97304 U.S.A.
Tel (503) 362-1135

Primarily a perennial grower of North American native plants, has some *Lilium*, *Trillium* and *Sanguinaria* species

Sunburst Bulbs

P.O. Box 183, Howard Place 7450, Republic of South Africa
Tel (021) 531-9829 Fax (021) 531-3181
Species and hybrids of South African bulbs, very variable list

The New Peony Farm

P.O. Box 18235, St. Paul MN 55118 U.S.A.
Ken Crossley Tel (612) 457-8994
Peony hybrids and species, sources of which are very few.

The Plumeria People

P. O. Box 820014, Houston TX 77282-0014 U.S.A.
Richard & Mary Helen Eggenberger Tel (713) 496-2352
A few assorted tropical bulbs, *Zephyranthes* and *Habranthus* species.

Van Engelen Inc.

313 Maple Street, Litchfield CT 06759 U.S.A.
Tel (203) 567-8734 Fax (203) 567-5323
28 page catalog of Dutch bulbs at very reasonable prices.

COMMERCIAL AND GARDEN SOURCES

B & D Lilies

330 "P" Street, Port Townsend WA 98368 U.S.A.
Bob & Dianna Gibson Tel (206) 385-1738 FAX (206) 385-9996
Cutting edge Oriental, Asiatic, and Aurelian hybrids, large number of species, also sells daylily and alstroemeria hybrids.

Borboleta Gardens

15980 Canby Avenue, Faribault MN 55021-7652 U.S.A.

Dave and Jeanne Campbell Tel (507)334-2807

Hybrid lilies, iris, daylilies and peonies.

The Bulb Crate

2560 Deerfield Road, Riverwoods IL 60015, U.S.A.

Tel (708) 317-1414

Primarily lily and iris hybrids.

Cascade Bulb and Seed

P. O. Box 271, Scotts Mills OR 97375 U.S.A.

Dr. Joseph C. Halinar Tel (503) 873-2218

Offers own seed and bulbs of lily and *Allium* species and hybrids. Also sells *Hemerocallis* species.

Crutchers Colors

18900 South Pear Road, Oregon City OR 97045 U.S.A.

Ken Crutcher Tel (503) 631-3656

Grows and sells own hybrids of Asiatic, Oriental and Trumpet lilies.

Dutch Gardens

P. O. Box 200, Adelphia NJ 07710 U.S.A.

Tel (908) 780-2713 FAX (908) 780-7720

Commercial Dutch importer for garden varieties; also some species.

Lindel Lilies

5510 239th Street, Langley, BC V3A 7N6 Canada

Linda & Del Knowlton Tel (604) 534-4729

Sells hybrid Oriental, Asiatic, and trumpet lilies and some species.

Messelaar Bulb Co.

P. O. Box 269, County Road, Route 1A, Ipswich MA 01938 U.S.A.

Pieter Messelaar Tel (508) 356-3737

Commercial Dutch importer for garden varieties.

The Lily Garden

36752 S. E. Bluff Road, Boring OR 97009 U.S.A.

Judith McCrae Tel (503) 668-5291

Lily hybrids and a nice selection of species.

Van Bourgondien Bros.

P. O. Box 1000

245 Farmingdale Road, Rte 109, Babylon NY 11702-0598 U.S.A.

Tel (800) 622-9997 FAX (800) 669-1228

Primarily garden varieties, but occasionally has an odd bulb of interest; not known for their customer satisfaction. Free catalog.

Van Dyck's Flower Farms, Inc.

P. O. Box 430, Brightwaters, NY 11718-0430 U.S.A.
Tel (800) 248-2852

A commercial Dutch importer for gardens. Good service and quality for the price.

SOCIETIES WITH A SEED EXCHANGE INCLUDING GEOPHYTES

These societies are absolutely the best way
of acquiring the difficult to locate species

Alpine Garden Society

Membership Secretary, AGS Centre
Avon Bank, Pershore, Worcestershire WR10 3JP England
Publishes a nice quarterly, seed list usually includes some *Rhodophiala*,
Alstroemeria and *Bomarea* species.

Botanical Society of South Africa (BSA)

Kirstenbosch, Claremont 7735, Republic of South Africa
Publishes a quarterly and an annual seed list from Kirstenbosch National
Botanic Garden.

North American Lily Society

Executive Secretary-Treasurer
P. O. Box 272, Owatonna MN 55060 U.S.A.
Dr. Robert Gilman
Publishes a Newsquarterly and an extensive seed list of lily species and
hybrids.

North American Rock Garden Society

Executive Secretary, P. O. Box 67, Millwood NY 10546 U.S.A.
Publishes a quarterly and good seed list including *Narcissus*, *Romulea*
and *Roscoea* species.

Scottish Rock Garden Club

20 Gorse Way, Formby, Merseyside L37 1PB, Scotland
Ian Aitchison, Treasurer
Publishes a good, biannual journal. Extensive seed list with a number of
South American species that seems to be supplementary to the AGS with
little overlap.

The Clivia Club

P.O. Box 6240, Westgate 1734, Republic of South Africa
Publishes a bulletin now and then; *Clivia* species, hybrids and sports.

The Indigenous Bulb Growers Society of South Africa (IBSA)

3 The Bend, Edgemoor, Capetown 7441, Republic of South Africa
Paul F.X. von Stein
Publishes an annual, a newsletter and a fairly variable seed list.

SWAP COLUMN

Exchanging plants and seeds is a great benefit to gardeners. Many friendships have blossomed along with the plants and seeds exchanged. We include this page to promote such plant and seed exchanges. Subscribers are first referred to the International Bulb Society Seed Exchange (see page 3 for information on the Seed Exchange). After checking the Seed Exchange list, if you are still unable to locate certain bulbs or plants, send your request to:

Swap Column, The International Bulb Society,
PO Box 92136, Pasadena CA 91109-2136,
United States of America.

Dennis Tsang, GPO Box 2306, Central, Hong Kong is seeking the bulbs listed below. Interested members can write to him for his latest bulb list and further details.

Mr. Tsang is seeking correspondents worldwide who share an interest in the Amaryllidaceae, particularly amaryllids from southern Africa, and a developing interest in South American amaryllids.

He also seeks plants or seeds of the following South American amaryllids: *Hippeastrum calyptratum*, *H. psittacinum*, *H. solandri-florum*, *H. machupijchensis*, *Stenomesson* species, particularly *S. variegatum*, *Pamianthe*, *Placea*, *Eucharis*, and *Paramongaia*. Plants from other areas: *Narcissus viridiflorus*, *Cryptostephanus vansonii*, and *Brunsvigia undulata*.

He has South African amaryllids: *Ammocharis*, *Crinum*, *Cydistetes*, *Cyrtanthus* species and hybrids, *Brunsvigia*, *Nerine*, *Haemanthus*, *Boöthane*, *Clivia*, *Lycoris* from China, and a few South American amaryllids including *Hippeastrum puniceum*, *H. reticulatum* var. *striatifolium*, *H. pardinum*, *H. rutilum* var. *fulgidum*, *Eucharis grandiflora*, and *Worsleya rayneri* (2 seedlings available) to swap for those items he is seeking.

Mr. Tsang is also seeking the book **GROWING BULBS** by Martin Rix, Timber Press, 1983. He doesn't mind a second hand book as long as it is in good condition without missing pages, illegible text, etc. He is willing to pay for the cost of the book and for postage.

SEEKING SOUTH AMERICAN CORRESPONDENTS

Mr. A. Koen, Casembrootlaan 39, 2681 PL Monster, Holland, is seeking IBS members in South America, especially Chile, Peru and Argentina, who would like to correspond concerning "bulbous" matters. Mr. Koen is very interested in the South American bulbs, especially *Leucocoryne*, *Zephyra*, etc.

BOOK REVIEWS

Cape Bulbs, by Richard L. Doult. 1994. Timber Press, 133 SW Second Ave., Suite 450, Portland OR 97204-9743. \$34.95. 254 pages. 24 x 16cm.

With an avalanche of good to excellent horticultural books upon us these days, and with no gap in works devoted to bulbs, nor in up-to-date pricing, it is more important than ever to gauge the practical use and overall value of any potential purchase. For many readers fortunate enough to reside in a Mediterranean climate, and for others willing to take some extra steps to grow bulbs from such regions, the geophytes of South Africa's glorious flora hold a special enchantment. Books on this specialized topic, new or old, are rather few, however. Thus may we welcome the appearance of Mr. Doult's well conceived contribution, **Cape Bulbs**. The first 59 pages are given over to mostly brief essays on such topics as "The Physical Environment of Cape Bulbs", conservation and culture. The last is covered nicely by several subheadings which address the topic from very different climate perspectives. Much of the same information may be applied with success to many geophytes from similar climates besides South Africa. Propagation from seed and leaf cuttings, hybridizing, cut flowers and pests and diseases are all covered fittingly, though under "pests" no mention is made of the bane of many a gardener's bulbous or non-bulbous existence: burrowing rodents. For other pest problems, Mr. Doult guides the reader along a sensible path we would all do well to follow regarding preventative hygiene and non-chemical means of control; chemical insecticides are reserved for only occasional, specific uses.

Because the author of **Cape Bulbs** has traveled in the field in South Africa, first hand habitat observations of the subject plants are sprinkled throughout the book. Mr. Doult also has managed a nursery devoted to South African bulbs and knows the plants first hand from cultivating many of the species. The bulk of the book, pages 60-225, addresses in encyclopedic form "several hundred species" in seventy-five genera of the most commonly encountered Cape bulbs. A typical genus entry contains the origin of the name, distribution and general description of the various species, followed by brief discussions on individual species. Though the number of species treated for a given genus has been kept necessarily relatively small, some very scarce plants, such as *Boöphane pulchra* and *Tenicroa multifolia*, are included alongside those more likely to be encountered in the trade. Interesting asides and quotes are amply given, and these tell specific horticultural histories, records of self-fertile/sterile species and mostly encouraging stories in the realm of conservation.

The illustrations in the book are partly comprised of seventy-five color plates, in one section toward the front of the book, of photographs of generally very good quality and usefulness, though

the depth of focus is often weak. To Shari Smith goes much credit for her distinctive and very pleasing pencil renderings, which appear as mostly full page entries throughout the text. The book itself handles quite comfortably in its dimensions, paper and binding.

No matter a book's showy pictures and useful information, if it is not a joy to read, what use is it taking up valuable shelf space? Any such fears are groundless in the present case, as Mr. Doult has an uncommon ability to write in a lucid, interesting style; "down-to-earth" and "friendly" could also be used to describe the feel of the text. Finally, in addition to an exhaustive list of references, which by itself would land the book in my library, a glossary and lists of suppliers and organizations are appended before the index.

A timely and important work, not too lengthy, yet comprehensive enough to be useful to quite a wide audience, **Cape Bulbs** may be soundly recommended to persons with any interest in South African plants in general and especially in the bulb flora that is the envy of the world.

Dylan P. Hannon

The Best Bulbs for Temperate Climates by Jack Hobbs and Terry Hatch. 1994. Timber Press, Inc., 133 S.W. Second Ave., Suite 450, Portland OR 97204-3527. \$32.95. 196 pages, 26 x 19cm.

Books on bulbs are numerous, but books with information that is brief, accurate and to the point are rather uncommon. This is a well thought out book. A brief introduction covers what geophytes are and where temperate climate bulbs originate. A chapter on cultivation covers the basics very well. Necessary advice for long-term cultivation of most Mediterranean bulbs includes such simple advice as "Most bulbs dislike too much compost or other organic matter...", probably the most common cause for new gardeners to lose newly planted bulbs of this type. Propagation is covered briefly and includes information about starting new bulbs from leaf cuttings of certain species and how to use "twin-scaling" to increase many true bulbs. Seed propagation is given in such a manner that any gardener should be able to successfully grow new and interesting geophytes from seed if the advice is followed.

The main part of the book is a listing of geophytes by genera, consisting of 145 pages, and with only a couple of exceptions, each genus has a color photo illustrating a representative plant. Emphasis is on those geophytes that are worthy of cultivation. For each genus additional cultivation and propagation information is given where needed. Species and cultivars listed are mostly available commercially or through specialist suppliers, though a few interesting genera and species which are rare in cultivation are also included.

Comments on some of the genera follow, including the wish that more plants could have been covered, which is of course not possible in a book this size and at such a reasonable price.

The list of *Albuca* species is short. Many make good garden plants and some of the dwarfer species, such as *A. spiralis*, make excellent container plants.

The name "Candelabra Lily" for *Brunsvigia* is very strange to me. All have an inflorescence that is globe-shaped, not upwards branching in any way. Common name aside, more of them should be grown in gardens where possible; the smaller species also do well in containers.

There is more information on *Calochortus*, a genus from western America, than I have ever seen in local gardening books. Excellent information is given on how to grow them; if this information is followed they should grow, flower and survive.

A group that is rarely mentioned in most books is well covered here — *Dahlia* species. The simple, colorful, daisy flowers are such a contrast to the hybrids which are so numerous but wonderful in their own right.

The best *Gladiolus* species for garden and container growing are listed, including a species I would never do without, *Gladiolus tristis*, with its strong and hauntingly wonderful fragrance. It is a delight also in flower arrangements, as are most species.

Lachenalia, a genus that all gardeners, beginners or advanced, should grow because they are so easy and interesting, has 25 species listed plus varieties of some of them. Noticeable is no mention that many of the species are fragrant, such as *L. pallida*.

This is the first bulb book I have ever seen that gives fair treatment to *Oxalis*, a group usually ignored. These are some of the finest winter and spring flowering container plants one can grow. The illustrations should get anyone inspired.

Errors are few, with only one being very obvious: a half page color photo labeled *Ranunculus cortusifolius* which actually depicts an amaryllid, probably a *Rhodophiala*.

There is a list of bulb and seed suppliers in New Zealand, Australia, South Africa, Great Britain and the United States.

The 175+ color photos are excellent and add life to the book. With only a couple of exceptions, the photographs are 1/4 page or larger in size. I hope they will inspire new and old gardeners alike to grow something wonderful they haven't grown before.

The Best Bulbs for Temperate Climates is a very good book. I highly recommend it to anyone interested in plants and gardening, and especially to those growers and future growers of the wonderful world of geophytes.

Michael G. Vassar

